











NBSIR 78-879

# EARTH TERMINAL MEASUREMENT SYSTEM OPERATIONS MANUAL

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David F. Wait

Electromagnetic Fields Division  
National Engineering Laboratory  
National Bureau of Standards  
Boulder, Colorado 80303

Prepared for:  
Commanding General  
United States Army Communications Command  
Fort Huachuca, Arizona 85613

April 1978

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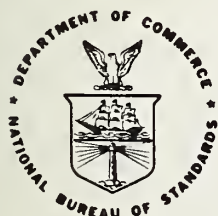
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# EARTH TERMINAL MEASUREMENT SYSTEM

## OPERATIONS MANUAL

David F. Wait

The Earth Terminal Measurement System (ETMS) was developed by the National Bureau of Standards to make accurate measurements of earth terminal and satellite parameters such as figure of merit (G/T), antenna gain relative to a reproducible reference level, satellite effective isotropic radiated power (EIRP), and ratio of carrier power to the operating noise temperature (C/kT). Because of difficulties of using the standard earth terminal parameters to precisely characterize the earth terminal, the parameters noise equivalent flux (NEF) and noise ulterior flux (NUF) are introduced. NEF characterizes the earth terminal hardware, and it is defined so that it is largely independent of frequency and antenna elevation angle. Thus, it is easier to evaluate the "reasonableness" of a particular set of results in light of the other results taken at various frequencies and elevation angles. This manual includes the theory of the measurements, measurement procedures, measurement troubleshooting, interpretation of the results, and a discussion of the ETMS software.

Key words: Earth terminal; effective isotropic radiated power; figure of merit; measurement procedure; noise temperature; satellite communication.

### 1. INTRODUCTION

This manual describes the operation of the earth terminal measurement system (ETMS). It includes the theory of the measurements that are implemented on the ETMS, the measurement procedures, the measurement troubleshooting, the interpretation of the results, and a discussion of the ETMS software. This manual does not include details on connecting the hardware, on hardware maintenance, or on hardware troubleshooting. These topics are discussed in the companion ETMS maintenance manual [7].

### 2. BACKGROUND

The radio star Cassiopeia A (Cas A) is used as a calibration source [1] for the measurements described in this report.

## 2.1 G/T and G/T<sub>a</sub>

To determine G/T, the ratio (Y) of the output noise power when the earth terminal antenna is pointed to Cas A to the output noise power when the antenna is pointed to the nearby cold sky is measured.

$$Y = (\Delta T_{\text{Cas}} + T)/T, \quad (1)$$

where  $\Delta T_{\text{Cas}}$  is the temperature rise due to Cas A at the antenna output port, and T is the system temperature expressed relative to the antenna output port. The temperature of the cold sky is included in T. The temperature rise caused by the star depends on the flux density of Cas A,  $S_{\text{Cas}}$  (W/m<sup>2</sup>/Hz) [2], and on the effective area of the antenna  $A_e$  (m<sup>2</sup>),

$$\Delta T_{\text{Cas}} = (1/2)k_1 k_2 k_3 k_4 k_5 k_6 k_7 S_{\text{Cas}} A_e / k \quad (2)$$

where  $S_{\text{Cas}} = (3154)e^{-0.0097\tau}(f/1000)^\alpha \times 10^{-26}$ ,  $\tau$  = the number of years since 1965.0,  $\alpha = -0.792 + 0.0012\tau$ , f is the frequency (Hz), k is Boltzmann's constant, ( $k = 1.38046 \times 10^{-23}$  J/K). The various  $k_i$ 's are defined by Daywitt [3],  $k_1$  is the atmospheric transmission correction factor,  $k_2$  is the star shape correction factor,  $k_3$  is the bandwidth correction factor,  $k_4$  is the differential system temperature factor,  $k_5$  is the antenna pointing correction factor,  $k_6$  is the polarization factor, and  $k_7$  is the system response correction factor. The factor 1/2 in eq. (2) accounts for the fact that only one polarization of radiation can be received from a star at any one time. If the antenna is reciprocal, then

$$A_e = c^2 G / (4\pi f^2) \quad (3)$$

where G is the antenna gain, c is the velocity of light ( $2.99793 \times 10^8$  m/s), f is the frequency (Hz), so

$$\Delta T_{\text{Cas}} = \xi_{\text{Cas}} G \quad (4)$$

where 
$$\xi = k_1 k_2 \cdots k_7 c^2 S / (8\pi k f^2) \quad . \quad (5)$$

For the measurements included in this report, power is measured relative to a stable and reproducible noise add reference signal,  $T_a$ , so

$$G/T_a = (\Delta T_{Cas}/T_a)/\xi_{Cas} \quad . \quad (6)$$

Combining eqs. (1) and (4)

$$G/T = (Y-1)/\xi \quad (7)$$

or expressed in decibels above one inverse degree kelvin,

$$G/T \text{ (dB/K)} = 10 \log_{10} G/T \quad . \quad (8)$$

## 2.2 Noise Equivalent Flux and Noise Ulterior Flux

The figure of merit ( $G/T$ ) for an earth terminal has several shortcomings for the precise characterization of an earth terminal. First, it neither characterizes the hardware, nor the hardware plus atmosphere, because the atmospheric effects are excluded from the antenna gain ( $G$ ). part of  $G/T$ , but are included in the system temperature part. Secondly, the noise performance of subcomponents of an earth terminal is characterized in terms of an effective noise temperature (or noise figure) and a gain/loss which obey familiar rules of combination. In contrast  $G/T$  has more complex combinational rules which are sometimes confused with the more familiar rules.

Thirdly, earth terminal noise characteristics and efficiency are largely independent of frequency while  $G/T$  is a function of frequency squared. Thus, if an earth terminal is being characterized at several different frequencies, it becomes somewhat more difficult to identify an abnormal measurement when using  $G/T$  as opposed to the use of a parameter that is not frequency-dependent. Lastly, inclusion of the atmospheric component in  $G/T$  makes it very difficult to determine the "reasonableness" of a set of results. That is, with small sets of data it is important to be able to judge whether the end points are valid. A reasonable change in hardware characteristics is much easier to estimate than

changes in hardware plus atmospheric effects. To avoid the above problems, the parameters Noise Equivalent Flux (NEF) and Noise Ulterior Flux (NUF) are introduced.

The Noise Equivalent Flux (NEF) density is a measure of the noise performance of the earth terminal analogous to effective input noise temperature for an amplifier. NEF is the ideal white, random noise flux density ( $\text{wm}^{-2}\text{Hz}^{-1}$ ) incident normal to the aperture of a noiseless equivalent earth terminal such that the output noise power equals the output noise power of the actual earth terminal. In terms of NEF, the Y-factor (eq. 1) is

$$Y = (k_1 \cdots k_7 S_{\text{cas}} + kT_{\text{sky}}/A_{\text{eo}} + \text{NEF}) / (kT_{\text{sky}}/A_{\text{eo}} + \text{NEF}) \quad (9)$$

where  $k_1 \cdots k_7$ ,  $S_{\text{cas}}$ , and  $k$  are defined as in eq. (2),  $T_{\text{sky}}$  is the noise power originating from the atmospheric losses along the antenna boresight, plus the three-degree kelvin cosmic background temperature, and  $A_{\text{eo}}$  is the antenna effective area at the antenna aperture (i.e., no resistive antenna losses included). Boltzmann's constant,  $k$ , and the antenna effective area,  $A_{\text{eo}}$ , are used to convert  $T_{\text{sky}}$  to a power density expressed in watts/meter<sup>2</sup>. Rearranging eq. (9),

$$\text{NEF} = k_1 k_2 \cdots k_7 S / (Y-1) - kT_{\text{sky}}/A_{\text{eo}} \quad (10)$$

If the atmosphere is included as part of the earth terminal, the corresponding noise equivalent flux is denoted NUF, or the noise ulterior flux density to emphasize that the input reference plane to the earth terminal is beyond the upper atmosphere.

$$\text{NUF} = k_2 \cdots k_7 S / (Y-1) - kT_{\text{cosm}}/A_{\text{eo}} \quad (11)$$

where  $T_{\text{cosm}}$  is the 3K cosmic background temperature, and no atmospheric absorption factor  $k_1$ , occurs.

### 2.3 EIRP

To measure satellite power, note that the power change,  $C$ , (watts) due to the carrier power at frequency  $f_0$  at the output port of the antenna is

$$C = W_o A_e \quad (12)$$

where  $W_o$  ( $W/m^2$ ) is the flux incident on the antenna. The flux incident on the antenna depends on the effective isotropic radiated power (EIRP) from the satellite and on the slant distance from the satellite to the earth terminal antenna,  $d(m)$ ,

$$W_o = k'_1 k'_2 k'_3 k'_4 k'_5 k'_6 k'_7 \text{EIRP}' / (4\pi d^2) \quad (13)$$

where the  $k'_1$  correction factors are similar to those in eq. (2) and are described by Daywitt [4], and the prime on EIRP' is a reminder that the EIRP depends on the angle between the boresight direction of the satellite antenna and the direction to the earth terminal. This difference in boresight EIRP and EIRP' is an antenna pointing correction factor known as the tilt differential. Rewriting eq. (13) using eqs. (3) and (12),

$$\text{EIRP} = L(C/G) / (k'_1 \dots k'_7) \quad (14)$$

where the space loss  $L \equiv (4\pi df/c)^2$ . For measurements in this report, powers are measured relative to a noise add reference,  $T_a$ , hence,  $C = kT_a B[y_o^{-1/2}(y_- + y_+)]$  and

$$\text{EIRP}' = LkB[y_o^{-1/2}(y_- + y_+)] / \{(G/T_a) k'_1 \dots k'_7\} \quad (15)$$

where  $k$  is Boltzmann's constant,  $B$  is the receive noise bandwidth of the Earth Terminal Measuring System (ETMS),  $y_o$  is the power relative to the noise add power when  $f_o$  is centered in the measurement pass band,  $y_-$  is the power relative to the noise add power when the frequency of the band pass is lowered so that none of the  $f_o$  power is in the measurement pass band, and  $y_+$  is the power relative to the noise add power when the measurement band pass is just above  $f_o$ .

#### 2.4 C/kT

The measurement of  $C/kT$  (ratio of carrier power to the operating noise temperature per hertz) differs from the other measurements in this report in



that no flux standard such as Cas A is required. Traditionally, there is accepted ambiguity between the parameters  $G/T$  and  $C/kT$  in that the symbol  $T$  is used differently. The  $T$  in  $G/T$  refers to the noise of only the earth terminal and is called the system noise temperature (SNT), while the  $T$  in  $C/kT$  refers to the operating noise temperature (ONT) of both the earth terminal and the noise being broadcast by the satellite. In terms of the symbols in eqs. (14) and (15)

$$C/kT = \left( \frac{y_o}{1/2(y_- + y_+)} - 1 \right) \frac{B}{k'_3 k'_4 k'_7} \quad (16)$$

## 2.5 Estimate of $T_a$ Using Moon Measurements

The moon is an extended source (large relative to the antenna beamwidth) for an AN/FSC-78 or AN/MS-60 earth terminal. The temperature rise in the antenna output due to the moon is the physical temperature of the moon diminished by the losses which occur between the moon and the antenna output port.

$$\Delta T_{\text{moon}} = k_1 \eta_{\text{rad}} \eta_{\text{bm}} (T_{\text{moon}} - T_{\text{cosm}}) \quad (17)$$

where  $k_1$  is the atmospheric loss,  $\eta_{\text{rad}}$  is the radiation efficiency of the antenna, and  $\eta_{\text{bm}}$  is the fraction of the antenna radiation pattern which "sees" the moon. To the extent that the right hand parameters in eq. (17) are known, the moon provides a signal of known amplitude in the earth terminal which can be used to calibrate  $T_a$ , and thus antenna gain.

## 2.6 Estimate of $T_a$ Using Antenna HPBW

The calculation of  $T_a$  from HPBW in the REWORK program involves several steps. First, the measured antenna HPBW and  $G/T_a$  are least squares fit to a constant plus cosecant of the antenna elevation term. The zenith fit values for  $G/T_a$  and HPBW are used for the subsequent calculations for  $T_a$ . The zenith HPBW value is corrected for the effect caused by the finite size of Cas A. Then the antenna gain,  $G$ , is calculated using the following empirical equations relating aperture efficiency,  $\eta_{\text{apr}}$ , HPBW(min), antenna diameter(ft),  $D$ , and  $G$ .

$$\eta_{\text{apr}} = \eta_{\text{rad}} / (\text{HPBW} \times D \times F / 3035)^2 \quad (18)$$



where  $\eta_{\text{rad}}$  is the radiation efficiency (assumed to be 0.98), and  $F$  is the frequency in gigahertz.

$$G = \eta_{\text{apr}} (DF/0.313)^2 . \quad (19)$$

Using the zenith value for  $G/T_a$ , and the empirical value for  $G$ , the magnitude of  $T_a$  is calculated.

### 3. MEASUREMENT INSTRUMENTATION

The measurement of the pertinent power ratios is accomplished using the Earth Terminal Measurement System (ETMS). The ETMS is an automated measurement system developed around the most accurate power measurement bridge known--the NBS type IV self-balancing bridge [5]. This bridge as implemented in the ETMS measures the ratio of stable noise powers to an accuracy of less than  $\pm 0.1\%$ .

A simplified block diagram of the ETMS is shown in figure 1. The ETMS contains eight subsystems: (1) a calculator which provides computation capability, a means of controlling each of the remaining subsystems under automatic sequence control, a means of storing the measurement results on magnetic tape in order to rework the data at a later time, and a keyboard to control the measurement procedures or to enter program modifications; (2) an NBS type IV self-balancing power bridge used to measure noise power; (3) a programmable voltmeter whose accuracy is a major factor in determining the accuracy with which the noise power is measured; (4) a multiplexer which connects the digital voltmeter to various measurement points of interest; (5) a digital clock needed to provide time information required to determine current star coordinates; (6) dual X-band solid state noise source to provide a stable reference signal needed to eliminate the effects of gain fluctuations in the earth terminal; (7) an external cassette which allows redundant recording of measurement data; and (8) an rf control unit which provides signal conditioning, system test signals, precision programmable attenuators, signal monitoring, alarm circuits, and interface circuits which allow the calculator to control the various measuring instruments.

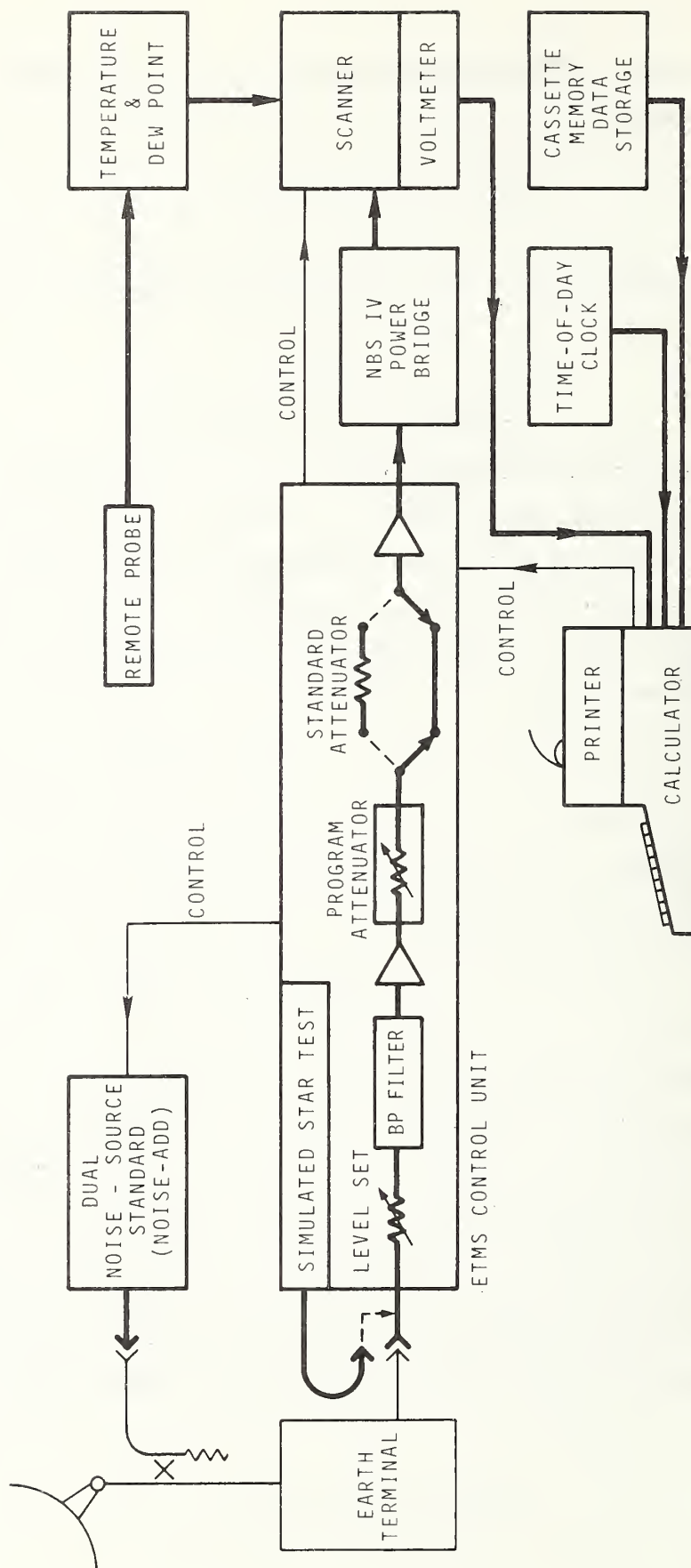


Figure 1. Block diagram of the Earth Terminal Measurement System.

#### 4. OVERVIEW OF MEASUREMENT PROCEDURES

The measurement procedure can vary with the measurement to be performed, so different procedures will be discussed separately.

##### 4.1 G/T, $G/T_a$ , NEF, and NUF Procedure

The G/T,  $G/T_a$ , NEF, and NUF are measured in the same procedure. Antenna gain is not measured directly because there is no access to the antenna output port. The output level of the reference noise source is calibrated but the signal which is coupled into the front end of the earth terminal and referred to as the noise add signal,  $T_a$ , is not known accurately because the coupling coefficient of the directional coupler is unknown. The magnitude of  $T_a$  is known approximately from antenna HPBW and moon measurements.

The measurement procedure contains seven steps. First, prior to arriving at the measurement site, the date of the measurement, the earth terminal's site coordinates, antenna diameter, aperture efficiency, radiation efficiency, operating frequency, bandwidth, and approximate G/T are entered into the computer program, and the expected measurement errors are printed, the star positions versus time are plotted, and the resulting data are stored onto a data cassette to be used at the measurement site. Using this information, the on-site measurement schedule is planned. The second measurement step is at the measurement site. The reference noise source is connected to the directional coupler in the antenna room, and the output from one of the earth terminal down converters is connected to the ETMS. A system check and an earth terminal system stability check is then performed. Thirdly, offset corrections for the antenna pointing are determined, and sky profiles (sky temperature versus antenna elevation along the star trajectory) are established. The fourth step, measurement data for G/T,  $G/T_a$ , NEF, and NUF is taken. A measurement set contains six cuts. For a cut, the antenna is pointed to a computed coordinate position; then a string of power measurements (typically 30) relative to the noise add signal are taken 6 seconds apart. One cut is taken on the cold sky about 2 degrees away (in declination) from Cas A. The remaining cuts are spaced equidistant throughout the main beam of the antenna pattern, and selected data points are least squares fit to a two-dimensional parabolic curve. The parabolic curve fit is used because it is the fit that requires the least computation time and computer memory yet still provides the needed antenna

pointing correction information. The data are stored and  $G/T$ ,  $G/T_a$ , NEF, NUF antenna half power beamwidths (HPBW), and updated antenna point offsets are calculated and printed out.

The fifth step of the procedure is the first level rework of the data. Each set of data (which consists of 6 cuts) is refit to a two-dimensional gaussian curve, and the resulting  $G/T$ ,  $G/T_a$ , NEF, NUF, and HPBW for each set are plotted as a function of antenna elevation. The gaussian curve fit is much slower than the parabolic fit, but it is a better approximation to the true curve shape. The gaussian curve can be used to fit the entire drift curve and thus allows a direct measurement of the relative temperature change caused by the star,  $\Delta T_{\text{cas}}/T_a$ , without depending on sky profile measurements made at a different time. This direct measurement of  $\Delta T_{\text{cas}}/T_a$  using gaussian curve fitting is immune from errors caused by directional dependent interference sources. The sixth step is to use the results of the first level rework to readjust the computation parameters and then to perform a second level rework. The seventh step is to delete any bad measurement sets and perform a third level rework which plots the results for the remaining measurement sets. The eighth and last step is to take the results from the last data rework and to enter them into the program used in step one which lists all the program assumptions and the resulting errors. The purpose for step seven is to reexamine the assumption and to record explicitly the conditions of the measurement.

#### 4.2 EIRP Procedure

The EIRP of a specific frequency from a satellite is measured in three steps. The first step is to measure  $G/T_a$  as a function of antenna elevation as described in section 4.1. Secondly, a narrowband filter in the ETMS is selected, and the power out of the earth terminal patch board is measured both in milliwatts and relative to the noise add reference for four situations: (1) the antenna pointed to the cold sky near the satellite, (2) the antenna pointed at the satellite and the earth terminal down-converter tuned to the satellite frequency of interest,  $f_o$ , (3) same as (2) except the down-converter tuned to the noise floor at a frequency just below  $f_o$ , and (4) same as (3) except at a frequency just above  $f_o$ . The EIRP is calculated using eq. (15). For each measurement situation, repeated measurements are taken to obtain a sense of the repeatability of the power level.



### 4.3 C/kT Procedure

C/kT is measured at the same time as EIRP, but also may be measured separately. The first step in the EIRP is not used for the C/kT measurement but the last two steps are used, and the results of the power measurements are entered into eq. (16) for the calculation.

## 5. OVERVIEW OF THE COMPUTER CASSETTE TAPES

The ETMS has eight computer tapes, (1) the equipment check (EQUIP CHECK) tape, (2) the site preparation program tape (SITE PREP), (3) the measurement program tape (MEAS), (4) the summary tape, (5) the rework program tape (REWORK), (6) the comments tape one which includes the list of simple computer variables and meanings, (7) the comment tape two containing the program matrix variables and meanings, (8) the comment tape three containing the special functions and meanings.

The major programs EQUIP CHECK, SITE PREP, MEAS, and REWORK can be loaded using a single cassette tape for each. This is made possible by duplicating certain files.

On the first three tapes each contain an identical file of subroutines, denoted as program "X." The rework tape also contains many of the same subroutines found in "X." Three tapes, SITE PREP, MEAS, and REWORK each contain star, site, and equipment characteristics information filed in the matrices S, T, and N. The EQUIP CHECK tape contains the matrix N file. Three tapes contain very similar files denoted LOADER used to load the "X" subroutines and the S, T, N matrices and the main program on that specific tape.

Each program (i.e., LOADER, EQUIP CHECK, SITE PREP, MEAS, REWORK, etc.) contains a position in the computer program that will be referred to as "The Restart Alternatives Position" (TRAP). On every program tape one way to reach TRAP is by pressing Key Ø (denoted  $f_0$  on the upper right hand set of program keys on the computer keyboard). This is the point on each program tape where the operator can choose the major options available on the program. This restart position is usually the position in the program where the computer stops when a task has been completed. Going to TRAP via Key Ø normally clears all of the adverse internal computer flags, etc., sometimes set up when a computer error is encountered.

After loading the SITE PREP program, either the MEAS or the REWORK programs can be loaded from TRAP without using LOADER or reloading the subroutines and the S, T, N matrices. Similarly, REWORK can be reached from TRAP in MEAS.

The summary tape is used in the external cassette at the same time either MEAS or REWORK is used. The summary tape collects duplicate measurement data when used with the MEAS tape. When used with the REWORK tape, the summary tape is the source of measurement data being reworked and the tape upon which the results are stored. In contrast, a MEAS tape is inserted for each data run; and, at the end of the data run, the measurement program and the measurement conditions are stored, the protect tabs are removed, and nothing new is ever written on it again. That is, the summary tape is a working tape, and a MEAS tape is an archives tape.

## 6. THE COMPUTER PROGRAMS

Following are a brief description of the purpose of a particular program and comment about the key structural elements of the program. These comments are then followed by an annotated computer printout.

The purpose of the annotated computer printouts is to provide comments and instructions in a terse form for the operation of the various computer programs and to display the normal responses to the computer-generated questions. In the context of the computer printout, some instructions are easier to locate, and the meaning more obvious. Keyboard entries, which can be deduced from the printout, have no special notation on the printout. For example, the demand for a keyboard entry is indicated by a question mark, so the entry after the question mark is the keyboard response. If there is no obvious response, the response is a space bar followed by execute, which is the standard response when the value of the parameter currently in the computer memory is satisfactory and no change is desired. Keyboard questions that are needed but are not obvious on the printout are indicated with an asterisk, followed by an explanation of the operation performed.

### 6.1. The Equipment Check Program

The purpose of the equipment check (EQUIP CHECK) program is to validate that the ETMS is operating satisfactorily after being transported, to establish the operating points and characteristics of the earth terminal, and to collect



historical information concerning normal operating conditions to aid in diagnosing which element of the system has failed.

At TRAP (e.g., via Key Ø) normally the "1 = AUTO CK" option is selected. The "Ø = KEY LIST" option prints the list of manual tests that can be selected using the various program keys. The manual operations allow a selection of graph scales, or measurement repeat numbers, etc. that is not available with the "AUTO CK" option. In the AUTO CK all the pertinent tests are performed in sequence with ranges and scales preselected. The various tests are discussed in the following paragraphs.

To execute a single test manually, enter TRAP to remove the AUTO CK flag (F2), then press the appropriate special function key. Additional information concerning the equipment check is contained on the annotated computer printouts in section 6.1.8.

#### 6.1.1 Key 1: Check List

The check list sequentially lists the nominal settings and conditions that are required for the normal operation and test conditions of the ETMS. In the AUTO CK option, there is an opportunity to step over the check list. The step-over would be appropriate if the operator has already performed the check list once and is redoing the AUTO CK to determine if the ETMS has stabilized.

#### 6.1.2 Key 2: Check DVM

The purpose of this routine is to verify that the digital voltmeter (DVM) is obeying the computer commands properly. The ETMS control unit sends a command to short the input to the DVM and change scale etc. The calculator display indicates the appropriate response, and holds this command condition until the operator presses some key - e.g., the space bar followed by pressing the "EXC" key. If the DVM fails to perform properly, check that control cables between the "ETMS Control Unit," the calculator, and the DVM are secure. If this does not solve the discrepancy refer to the maintenance manual.

#### 6.1.3 Key 3: Check Channel Voltages

The purpose of this check is to verify that the various power supply voltages are correct, and that all of the multiplexer commands are being prop-

erly executed. This program sequentially selects the multiplexer channels starting with channel zero, then reads the voltmeter, prints out the results, compares the voltmeter reading with nominal conditions, and prints out "NOT NORMAL" for the channels which are outside the expected range for stabilized operation of the ETMS. When the equipment check is right after the equipment is first turned on (as it should be), several of the channel checks typically indicate not normal. More will be said of this in the following detailed considerations of the channel voltage checks. If a channel voltage continues to be out of normal range after three hours, unless otherwise indicated below, check that all the cables are connected properly, then consult the maintenance manual.

#### 6.1.3.1 Channel 0: GROUND DVM

When the ETMS has stabilized, the output of the DVM with its input grounded should be zero within  $10^{-5}$  volts. It typically requires three hours' operation before the voltage is consistently within tolerance. If the voltage is not within tolerance after three hours' operation, the DVM should be rezeroed using the zero set adjust on the front of the DVM. To ground the DVM, one can either stop the program mode by pressing the "end" key, then use the keyboard entry FNX 111, Exc, or enter the control code 111 (binary number 110 1111) into the program switch keys on the ETMS Control Unit and press the "load" switch. For the adjustment, the DVM is taken out of program control via the "program control" button on the DVM front panel and switched manually to the most sensitive voltage scale, and the "external rate" knob rotated full cw. After the adjustment, the "program control" button must be returned to the in position, and the "external rate" knob in the full ccw position.

#### 6.1.3.2 Channel 1: Temperature

If the remote temperature probe is connected, the Channel 1 voltage reading is the probe temperature in Fahrenheit [8] divided by 100. The indicated temperature should immediately be within 3 degrees of the temperature as registered on the standby manual temperature/relative humidity meter, or as displayed by the temperature readout on the temperature/humidity unit. If the remote temperature probe is not connected, then the Channel 1 voltage is not important.

#### 6.1.3.3 Channel 2: Dew Point

If the dew point sensor with its lithium chloride bobbin is installed according to the site set-up instructions in the maintenance manual, the voltage in Channel 2 is the dew point temperature divided by 100 as indicated by the dew point readout. The dew point reading will not be accurate for at least 30 minutes. The dew point detector will not function when the outdoor temperature is below freezing. The relative humidity calculated from the dew point reading should agree with the relative humidity reading on the standby manual temperature-relative humidity meter within about 10%.

#### 6.1.3.4 Channel 3: +20 Volts, RF Unit

Channel 3 monitors the primary power supply in the ETMS Control Unit which powers the two 10-200 MHz signal amplifiers. Check the J355/665 cable, or consult the maintenance manual.

#### 6.1.3.5 Channel 4: +12 volt, RF Unit

Channel 4 monitors the power supply/reference voltage which powers the simulated noise add sources.

#### 6.1.3.6 Channel 5: D/A Output

Channel 5 monitors the programmable stable offset voltage used for the NBS type IV power bridge.

#### 6.1.3.7 Channel 6: Crystal Diode Voltage

Channel 6 monitors the crystal diode voltage. The crystal diode voltage is used to activate the power alarm circuit which is used to protect the thermistor power element in the NBS type IV power bridge. The crystal output is a negative voltage proportional to the incident power.

#### 6.1.3.8 Channel 7: D/A Reference Voltage

Channel 7 monitors the precision voltage which determines the accuracy of the digital voltage to analogue voltage converter which is used as the precision offset voltage needed in conjunction with the NBS type IV power bridge. If this

voltage is not normal, check the operation of the digital voltmeter or consult the maintenance manual.

#### 6.1.3.9 Channel 8: Power Bridge Output

Channel 8 monitors the voltage across the NBS type IV power bridge. This voltage requires about three hours to stabilize to within  $\pm 0.2$  volts.

#### 6.1.3.10 Channel 9: Set Fine Voltage

Channel 9 sets the precision digital offset voltage used to buck out the voltage across the NBS type IV power bridge. This bucking voltage is used to improve the resolution of measuring the small change in voltage caused by the microwave power changing the resistance of the power sensing thermistor. The magnitude of Channel 9 is approximately 1/10 of the Channel 5 voltage.

#### 6.1.3.11 Channel 10: Power Bridge vs. Fine Reference

The Channel 10 voltage is the power bridge voltage bucked near zero by the precision digital offset voltage as set using a Channel 9 command.

#### 6.1.4 Key 4: Check Program Attenuators

The purpose of this test is to verify the proper operation of the program attenuators, particularly for measurements of EIRP or C/kT. In addition, the measured value of the standard attenuation is measured over a 16-dB range. This check is one of the checks of the linearity of the ETMS measurement system. The repeatability of the measured values is printed out, as is a running printout of the drift in the absolute power level throughout the duration of the test. Thus, besides testing the attenuation steps of the programmable attenuator, this test also indicates short-term, and moderate-term stabilities of the ETMS and ETMS internal noise sources. If a record of the earth terminal short- and medium-term stabilities is desired, instead of using the internal ETMS noise source, the earth terminal with the ETMS microwave noise sources can be connected as the test signal.



#### 6.1.5 Key 5: Graph Option:

##### Check Power, Linearity, and Stability of Type IV Bridge

This check is a similar check to the last check except the results are presented graphically. In this check three measurements of the attenuation of the standard attenuator are averaged together, and the mean and standard deviations are plotted. The initial power level of this power ratio test is varied over a 16-dB range. Any nonlinearity of the type IV power bridge, or unusually noisy measurement conditions are easiest to spot on this graph. The magnitude of the nonlinearity may also be identified on the Key 4 or Key 6 tests. Any failure of the standard attenuator, or of the relays which switch the standard attenuator in and out are most obvious in this test. If a power supply becomes very noisy, it can show up as a change in nonlinearity (i.e., a change in the change of the value measured for the standard attenuator versus input power magnitude).

#### 6.1.6 Key 5: Table Option:

##### Check Power, Linearity, and Stability of the Type IV Bridge

A second option of Key 5 is to print out the key bridge voltages for repeated power measurements. If one of the multiplexer relays fails to operate correctly, the identification of which relay is malfunctioning is often obvious from which measured voltage value becomes unstable.

#### 6.1.7 Key 6: Noise Add Test

This check is designed to check the operation and stability of the noise add sources. When the ETMS input is connected to the internal noise add sources, it checks the amplitudes and stabilities of the internal noise add sources. When the ETMS is connected to the earth terminal, this test checks the magnitude and stability of the microwave noise add. Information on the stability of the earth terminal also is recorded.

The power of the system noise, the power from noise add #1 and noise add #2, is printed out before the stability test begins. If one of the noise add sources is not functioning, this will be obvious here. In the main printout, the power measurements and power ratios are printed in the first row, and the standard deviation of the measurements are printed in the second row.

The power ratios listed in the five right-hand columns of the test should be independent of initial power level. In particular, the ratio of noise add #1 to noise add #2 at a particular frequency should not change significantly over a long period of time. If it does, it signifies that one of the noise add sources is drifting or is becoming unstable. An unstable noise add source introduces an unnecessary measurement error and needs to be corrected.



## 6.1.8 EQUIP CHECK ANNOTATED PRINTOUT

\* INSERT EQUIP CHECK TAPE

```
LOAD
PCH
PRCH:SPCH TAPE,DISK(10)=INT TAPE(10)
10
```

0=RE 1=1-AUTO ON =NO: 1   TRAP

```
KEY 0: RESTART
KEY 1: CHECK LIST
KEY 2: CHECK DVM
KEY 3: CHECK CHANNEL VOLTAGES
KEY 4: CHECK ATTENUATORS
KEY 5: CHECK PNP, TYPE 1V & ATTN STABILITY
KEY 6: CHECK NOISE ADD STABILITY
KEY 7: CHANGE STANDARD ATTENUATION VALUE
KEY 8: NEW FREQ, BW, INPUT ATTN, SIML STAR NOISE
```

ONLY VIA KEY FUNCTION CAN NEW A3 = STD ATTN VALUE BE CHANGED

(Normally a new A3 value is not inserted until after the other checks have made the need for a change obvious)

\* Press KEY 7

```
0=KEY LIST,1=AUTO ON =NO: 1 9STD 6.1000 3BX =NO: 4.0738 94.88
STD 6.1066 dBX =NO: 4.0000 94.085
STD 6.1113 dBX =NO: 4.0858 94.89
STD 6.1172 dBX =NO: 4.0930 94.0738
```

↑ New A3

\* press Key 0 to EXIT

# EQUIP CHECK (cont)

0=LET LIST:1-AUTO CHECK -FHC-: 1 01

ID CHECK LIST: 1 DVM -0000001

*0 response bypasses questions in this box*

END: ALL SET

8 AC PWR SWITCH ON?

DADA: EXT RATE FULL COMP

DADA: DATA OUTPUT BUTTON IN?

DADA: PROGRAM CONTROL BUTTON IN?

RF UNIT: BANDPASS: FREQ @ 5.3MHz/70MHz?

RF UNIT: ATTEN SET TO 17 dB?

RF UNIT: SIN SWR NOISE @ 3.5 dB?

RF UNIT: METER RANGE 11?

NOISE SOURCE CONNECTED TO RF INPUT?

RF UNIT: OUTPUT METER @ -5.5 dB?

CLOCK UNIT: SET DATE?

CLOCK UNIT: SET GMT TIME?

END

(76 1024 21.28)

NBS1E.12 D5-FW0 EQUIP CHECK T1-F0: W.05 (D1-4 12-4

-1-

System # 6.09

RUN 0

PROG KEY 2:

CHECK DIGITAL MULTIMETER

DVM FUNCTION 1111: FILTER OUT?

DVM FUNCTION 1110: FILTER IN?

1000 VOLT RANGE 0

RANGE # 0 DEC PLACES 3  
*i.e. 0.00 displayed on DVM*

? 100 VOLT RANGE 0

RANGE # 1 DEC PLACES 3  
*i.e. 0.000 " " " "*

" 10 VOLT RANGE 0

RANGE # 2 DEC PLACES 4  
*etc.*

0 1 VOLT RANGE 0

RANGE # 3 DEC PLACES 5

? 0.1 VOLT RANGE 0

RANGE # 4 DEC PLACES 6

? AUTO-VOLT RANGE 0

RANGE # 7

END

# EQUIP CHECK (cont)

1976 October 24 <sup>range</sup> 21:29 <sup>min</sup>

REVISION 18-F1 [REDACTED] 18-F1 [REDACTED] 18-F1

MAIN PAGEM LOADED SUBROUTINE LOADED

-2-

8.18 ± 0.02

REVISION  
ETMS SERIAL NO.

PROG KEY 3:

CHECK CHANNEL VOLTAGES

CHANNEL	VOLTAGE	STATUS	NOMINAL	± RANGE
0=IC OFFSET	0	OK	0	1.00000E-05
1=TEMP	0.74184 = 74.184 F	OK	0.5	0.5
2=DEW POINT	0.4313 = 43.13 F	OK	0.5	0.5
3=-20 VOLTS	20.019	OK	20	0.2
4=+12 VOLTS	11.9878	OK	11.9	0.1
5=IAC OUTPUT	4.8326	OK	4.8333	0.02
6=ITAL DIODE	-1.71600E-03	OK	-0.0125	0.0125
7=D A REF	6.2367	OK	6.24	0.01
8=BRDG OUTPUT	2.4820	OK	2.5	0.1
9=1ST FINE REF	0.48333	OK	0.486688	5.00000E-03
10=BRDG vs REF	-1.07000E-04	OK	0	1.00000E-03

# EQUIP CHECK (cont)

NBS1E.12 <D5-F0> EQUIP CHECK T1-F0: X.05 <D1-4> T2-4

System # 6.09

-3-

RUH 0

PRG KEY 4: CHECK ATTENUATORS

SIML STAR ATTN: 3.5 dB  
INPUT ATTN: 17 dB  
STD ATTN: 6.100 dB

IF FREQ: 70 MHz  
BNDWD: 5.3 MHz  
#1/#2add: 0.2468

VALUE ASSUMED FOR STD

NBS TYPE IV OUTPUT 0.43401 MM +- 0.152 % [3 MEAS] STD CK: 0.014 DB

X ATTN	PRGM ATTN #1 PRGM ATTN #2	#1 PWR OR VOLT #2 PWR OR VOLT	ORIG PWR/#1 PWR STD CK @ #2	#1 PWR/#2 PWR NOMINAL #1/#2
				PRGM ATTN USED
17 DB	0 DB 1 DB	0.43343 +- 0.19 % 0.34637 +- 0.19 %	0.001 DB 0.023 DB	0.974 DB 1 DB * 1dB
17 DB	0 DB 2 DB	0.43298 +- 0.13 % 0.27599 +- 0.19 %	0.010 DB 0.007 DB	1.956 DB 2 DB * 2dB
17 DB	0 DB 3 DB	0.43347 +- 0.03 % 0.22026 +- 0.12 %	0.005 DB 0.017 DB	2.940 DB 3 DB 1+2
17 DB	0 DB 4 DB	0.43249 +- 0.14 % 0.17480 +- 0.38 %	0.015 DB 0.013 DB	3.934 DB 4 DB * 4dB
17 DB	0 DB 5 DB	0.43336 +- 0.11 % 0.13949 +- 0.14 %	0.007 DB 0.005 DB	Should Be 4.923 DB Less than ± 0.0305 DB 4+1
17 DB	0 DB 6 DB	0.43273 +- 0.14 % 0.11151 +- 0.12 %	0.013 DB 0.014 DB	5.889 DB 6 DB 4+2
17 DB	0 DB 7 DB	0.43292 +- 0.28 % 0.08900 +- 0.07 %	0.011 DB 0.005 DB	6.870 DB 7 DB 4+2+1
17 DB	0 DB 8 DB	0.43256 +- 0.28 % 0.06903 +- 0.08 %	0.015 DB 0.013 DB	7.970 DB 8 DB * 8dB
17 DB	0 DB 9 DB	0.43297 +- 0.13 % 0.05504 +- 0.21 %	0.010 DB 0.019 DB	8.958 DB 9 DB 8+1
17 DB	0 DB 10 DB	0.43148 +- 0.15 % 0.04391 +- 0.08 %	0.025 DB 0.010 DB	9.924 DB 10 DB 8+2
17 DB	0 DB 11 DB	0.43103 +- 0.10 % 0.03502 +- 0.17 %	0.030 DB 0.004 DB	10.902 DB 11 DB 8+2+1
17 DB	0 DB 12 DB	0.43114 +- 0.12 % 0.02232 +- 0.06 %	0.029 DB 0.007 DB	12.860 DB 12 DB 8+4
17 DB	0 DB 13 DB	0.43290 +- 0.18 % 0.02236 +- 0.26 %	0.011 DB -0.001 DB	12.870 DB 13 DB 8+4+1
17 DB	0 DB 14 DB	0.43306 +- 0.16 % 0.01784 +- 0.20 %	0.010 DB 0.003 DB	13.852 DB 14 DB 8+4+2
17 DB	0 DB 15 DB	0.43207 +- 0.19 % 0.01420 +- 0.18 %	0.001 DB 0.003 DB	14.832 DB 15 DB 8+4+2+1

# EQUIP CHECK (cont)

(76 1024 11.32)

NBS1E.12 <D5-F0> EQUIP CHECK T1-F0: X.05 <D1-4> T2-4

Sysm # 6.09

-4-

RUN 0

PROG KEY 5:

CHECK PWR, LINEARITY, STAB OF TYPE IV

SIML STAR ATTN: 3.5 dB  
INPUT ATTN: 17 dB  
STD ATTN: 6.100 dB

IF FREQ: 70 MHz  
BNWD: 5.3 MHz  
#1/#2add: 0.2468

NO.	BRIG V	<i>AV, RF put off</i>			PWR(MW)	CK ERR	SIGMA
		V7	V8	V9			
1	2.4839	0.000436	-0.012847	0.000435	0.3290MW	<del>0.0179DB</del>	0.20%
2	2.4839	0.000439	-0.002803	0.000436	0.0804MW	0.0179DB	0.00%
3	2.4839	0.000438	-0.012810	0.000434	0.3281MW	0.0060DB	0.19%
4	2.4839	0.000437	-0.002798	0.000431	0.0802MW	0.0174DB	0.19%
5	2.4839	0.000435	-0.012810	0.000432	0.3281MW	0.0166DB	0.16%
6	2.4839	0.000434	-0.002807	0.000429	0.0804MW	0.0078DB	0.14%
7	2.4839	0.000431	-0.012863	0.000427	0.3293MW	0.0237DB	0.19%
8	2.4839	0.000431	-0.002808	0.000426	0.0803MW	0.0263DB	0.11%
9	2.4839	0.000429	-0.012810	0.000426	0.3279MW	0.0085DB	0.19%
10	2.4839	0.000428	-0.002814	0.000424	0.0804MW	0.0039DB	0.11%
11	2.4839	0.000428	-0.012797	0.000423	0.3276MW	-0.0011DB	0.20%
12	2.4839	0.000425	-0.002815	0.000422	0.0804MW	0.0010DB	0.10%
13	2.4839	0.000425	-0.012866	0.000421	0.3292MW	0.0227DB	0.21%
14	2.4839	0.000423	-0.002813	0.000420	0.0803MW	0.0280DB	0.10%
15	2.4839	0.000420	-0.012854	0.000416	0.3288MW	0.0225DB	0.20%
16	2.4839	0.000421	-0.002821	0.000416	0.0804MW	0.0158DB	0.03%
17	2.4839	0.000418	-0.012837	0.000414	0.3283MW	0.0096DB	0.19%
18	2.4839	0.000417	-0.002820	0.000413	0.0803MW	0.0156DB	0.09%
19	2.4839	0.000415	-0.012849	0.000411	0.3285MW	0.0186DB	0.16%
20	2.4839	0.000413	-0.002829	0.000410	0.0804MW	0.0112DB	0.09%
21	2.4839	0.000412	-0.012841	0.000410	0.3283MW	0.0079DB	0.17%
22	2.4839	0.000410	-0.002832	0.000407	0.0804MW	0.0079DB	0.09%
23	2.4839	0.000410	-0.012831	0.000406	0.3280MW	0.0037DB	0.17%
24	2.4839	0.000407	-0.002836	0.000403	0.0805MW	0.0030DB	0.09%
25	2.4839	0.000406	-0.012884	0.000402	0.3292MW	0.0190DB	0.17%
26	2.4839	0.000404	-0.002841	0.000400	0.0805MW	0.0163DB	0.19%
27	2.4839	0.000404	-0.012850	0.000399	0.3283MW	0.0044DB	0.17%
28	2.4839	0.000402	-0.002845	0.000399	0.0806MW	0.0011DB	0.11%

10 of 14 MEAS  
at 0.38 MW

10 of 14 MEAS  
at 0.08 MW



# EQUIP CHECK (cont)

76 1024 21.40  
 NBS1E.12 (D5-F0) EQUIP CHECK T1-F0: X.05 (D1-4 T2-4

Sysn # 6.09 -5- RUN 0

PROG KEY 5: CHECK PWR, LINEARITY, STAB OF TYPE IV

SIML STAR ATTN: 3.5 dB IF FREQ: 70 MHz  
 INPUT ATTN: 17 dB BNDWD: 5.3 MHz  
 STD ATTN: 6.100 dB #1/#2 add: 0.2463

#1 LEVEL: 17 DB EXT + 0 DB CK STD MEAS/PLOT PT = 3  
 #2 LEVEL: 17 DB EXT + 1 DB CK STD UNIT = 0.0100 DB

-0.250 -0.150 -0.050 0.050 0.150 0.250 DB  
 !.....!.....!.....!.....!.....!.....!

#/TIME		ZERO= 6.125 DB	AVE	#1 PWR
1		!	6.1247DB	0.423MW
2		!	6.1129DB	0.344MW
3		!	6.1218DB	0.375MW
4		!	6.1164DB	0.319MW
5		!	6.1113DB	0.175MW
6		!	6.1119DB	0.140MW
7		!	6.1086DB	0.111MW
8		!	6.1202DB	0.089MW
9		!	6.1139DB	0.069MW
10		!	6.1093DB	0.055MW
11		!	6.1148DB	0.044MW
12		!	6.1057DB	0.035MW
13		!	6.0790DB	0.014MW
14		!	6.1051DB	0.022MW
15		!	6.0871DB	0.018MW
16		!	6.1088DB	0.013MW
17		!	6.1145DB	0.023MW
18		!	6.1205DB	0.040MW
19		!	6.1201DB	0.027MW
20		!	6.1227DB	0.017MW
21		!	6.1197DB	0.012MW
22		!	6.1187DB	0.037MW
23		!	6.1169DB	0.109MW
24		!	6.1181DB	0.087MW
25		!	6.1127DB	0.068MW
26		!	6.1019DB	0.055MW
27		!	6.1149DB	0.044MW
28		!	6.1294DB	0.035MW
29		!	6.1025DB	0.028MW
30		!	6.1095DB	0.022MW
31		!	6.1008DB	0.018MW
32		!	6.0756DB	0.014MW
33		!	6.1095DB	0.028MW
34		!	6.1188DB	0.042MW
35		!	6.1213DB	0.027MW
36		!	6.1288DB	0.218MW

INPUT  
 PWR  
 CYCLE

21.50 TIME  
 21 hrs 50 min

← 10 →

# EQUIP CHECK (cont)

(76 1024 21.95)

NBS1E.12 D5-F00 EQUIP CHECK T1-F00 1.35 D1-4 T2-4

System # 6.09

-6-

PROG KEY 6:

RTMS CONNECTED TO NOISE SOURCES RUN 0  
 SIMULATED NOISE ADD TEST

SIML STAR ATTN: 3.5 dB  
 INPUT ATTN: 17 dB  
 STD ATTN: 6.100 dB

IF FREQ: 70 MHz  
 BNDWD: 5.2 MHz  
 #1/#2add: 1.2468

PWR MEASURED INDIRECTLY

SHOULD AGREE

P = 0.4242 mW add #1 = 0.1545 mW add #2 = 0.6021 mW meas/set = 3  
 WILL AGREE ONLY IF STD ATTN CORRECT VALUE SHOULD BE BASICALLY INDEPENDANT OF INPUT PWR VALUE

P (mW)	P+1+2	#1+2	#2+2	#1+2	#1/#2	P/#1	P/#2	P+1+2	STDev
0.4260	0.2878	0.1541	0.5993	0.7466	0.2572	2.7631	0.7117	0.5704	0.0213
0.13%	0.07%	0.67%	0.37%	0.12%	0.30%	0.76%	0.50%	0.16%	0.0157
0.3403	0.2299	0.1292	0.4775	0.5959	0.2579	2.7612	0.7120	0.5719	0.0161
0.16%	0.17%	0.24%	0.16%	0.25%	0.12%	0.07%	0.11%	0.22%	0.0058
0.2712	0.1832	0.0979	0.3812	0.4751	0.2570	2.7712	0.7119	0.5706	0.0147
0.14%	0.15%	0.58%	0.58%	0.29%	1.01%	0.66%	0.70%	0.45%	0.0043
0.2168	0.1466	0.0782	0.3045	0.3803	0.2568	2.7720	0.7116	0.5699	0.0210
0.11%	0.11%	1.17%	0.48%	0.13%	0.97%	1.27%	0.46%	0.13%	0.0040
0.1721	0.1161	0.0620	0.2423	0.3007	0.2560	2.7734	0.7095	0.5724	0.0161
0.13%	0.12%	0.86%	0.55%	0.16%	0.32%	0.91%	0.56%	0.12%	0.0091
0.1374	0.0930	0.0498	0.1932	0.2414	0.2580	2.7371	0.7123	0.5689	0.0120
0.13%	0.21%	0.47%	0.34%	0.28%	0.30%	0.58%	0.33%	0.27%	0.0267
0.1037	0.0742	0.0397	0.1555	0.1926	0.2551	2.7669	0.7053	0.5702	0.0132
0.10%	0.37%	1.23%	0.30%	0.65%	0.93%	1.17%	0.29%	0.78%	0.0062
0.0877	0.0594	0.0315	0.1228	0.1541	0.2568	2.7807	0.7140	0.5688	0.0142
0.15%	0.27%	0.38%	0.12%	0.55%	0.41%	0.42%	0.15%	0.78%	0.0051
0.0680	0.0460	0.0245	0.0956	0.1195	0.2564	2.7727	0.7111	0.5689	0.0109
0.14%	0.32%	0.71%	0.61%	0.47%	0.38%	0.75%	0.74%	0.47%	0.0188
0.0543	0.0367	0.0198	0.0765	0.0953	0.2585	2.7441	0.7096	0.5695	0.0101
0.10%	0.08%	0.63%	0.06%	0.15%	0.68%	0.63%	0.05%	0.22%	0.0072
0.0433	0.0293	0.0156	0.0612	0.0761	0.2545	2.7792	0.7072	0.5691	-0.0077
0.17%	0.34%	0.76%	3.18%	0.48%	0.73%	0.99%	0.11%	0.38%	0.0120
0.0346	0.0234	0.0125	0.0485	0.0608	0.2583	2.7662	0.7146	0.5688	0.0014
0.17%	0.16%	1.07%	0.48%	0.21%	1.32%	1.27%	0.65%	0.15%	0.0177
0.0263	0.0186	0.0084	0.0387	0.0482	0.2161	2.7480	0.7105	0.5685	-0.0068
14.16%	9.20%	4.71%	0.23%	0.30%	4.14%	1.10%	0.15%	0.28%	0.0071
0.0219	0.0148	0.0079	0.0310	0.0384	0.2555	2.7733	0.7078	0.5706	0.0043
0.26%	0.00%	0.31%	0.30%	0.11%	0.39%	0.55%	0.23%	0.31%	0.0204
0.0175	0.0118	0.0063	0.0246	0.0307	0.2577	2.7580	0.7103	0.5689	0.0103
0.17%	0.32%	1.41%	0.61%	0.45%	0.81%	1.47%	0.79%	0.41%	0.0197

# EQUIP CHECK (cont)

(76 1024 23.13)  
NBS1E.12 (DS-F0) EQUIP CHECK T1-F0: X.05 .01-4> T2-4

REPEATED TO SEE IF SYSTEM WARMED UP

-7-

Sysm # 6.09

RUN 0

PROG KEY 3: CHECK CHANNEL VOLTAGES

CHANNEL	VOLTAGE	STATUS	NOMINAL	+ - RANGE
0=DC OFFSET	0	OK	0	1.00000E-05
1=TEMP	0.73299	OK	0.5	0.5
2=DEH POINT	0.43129	OK	0.5	0.5
3=+20 VOLTS	20.019	OK	20	0.2
4=+12 VOLTS	11.9881	OK	11.9	0.1
5=DAC OUTPUT	4.8326	OK	4.8382	0.02
6=XTAL DIODE	-1.73800E-03	OK	-0.0125	0.0125
7=D/A REF	6.2367	OK	6.24	0.01
8=BRDG OUTPUT	2.4828	OK	2.5	0.1
9=SET FINE REF	0.48382	OK	0.487188	5.00000E-03
10=BRDG vs REF	3.85000E-04	OK	0	1.00000E-03

CONNECT EARTH TERM; SET PWR LEVEL( =NO): 1 ?  
*Request to connect earth terminal to ETMS for the earth terminal test*

IF NEED TO CHANGE ATTN etc. , when finished (1) press key 8 (to remove auto fly) then (2) press key 6 for earth terminal test

# EQUIP CHECK (cont)

076 1024 0.29)  
NBS1E.12 (D5-F0) EQUIP CHECK T1-F0: %.05 (D1-4 T2-4

-8-

Sysm # 6.00

TESTS ETMS MICROWAVE NOISE ADD SOURCES PUN 0  
OF THE PROPERTIES OF THE EARTH TERMINAL

1670:  
CONT

PROG KEY 6:

EARTH TERMINAL TEST

SINL STAR ATTN: 3.5 dB  
INPUT ATTN: 17 dB  
STD ATTN: 6.100 dB

OTHER WISE SAME AS SIMULATED  
IF FREQ: 70 MHz NOISE ADD TEST  
BNDWD: 5.3 MHz  
#1/#2add: 0.2468

P= 0.3198 mW add #1= 0.1152 mW add #2= 0.4515 mW meas/set= 3

P(mW)	P+1+2	#1(mW)	#2(mW)	#1+#2	#1/#2	P/#1	P/#2	P/1+2	STDck dB
0.3255 0.92%	0.2197 1.16%	0.1167 0.47%	0.4555 0.82%	0.5694 1.32%	0.2562 0.56%	2.7795 1.04%	0.7119 0.33%	0.5722 0.49%	0.0116 0.0041
0.2661 0.61%	0.1798 0.66%	0.0962 1.67%	0.3732 0.61%	0.4656 0.78%	0.2579 1.45%	2.7574 1.48%	0.7114 0.16%	0.5728 0.40%	0.0129 0.0170
0.2190 0.33%	0.1476 0.34%	0.0789 0.85%	0.3081 0.68%	0.3826 0.38%	0.2561 1.53%	2.7756 1.16%	0.7095 0.33%	0.5720 0.32%	0.0135 0.0027
0.1771 0.18%	0.1195 0.10%	0.0639 0.92%	0.2483 0.59%	0.3089 0.12%	0.2574 0.79%	2.7673 0.83%	0.7128 0.58%	0.5716 0.18%	0.0153 0.0062
0.1405 0.16%	0.0950 0.34%	0.0510 0.67%	0.1973 0.29%	0.2464 0.45%	0.2585 0.53%	2.7539 0.70%	0.7129 0.11%	0.5709 0.31%	-0.0020 0.0174
0.1148 1.06%	0.0775 1.46%	0.0416 1.23%	0.1611 1.33%	0.2009 1.56%	0.2583 0.72%	2.7525 0.65%	0.7112 0.20%	0.5719 0.27%	-0.0028 0.0084
0.1119 0.13%	0.0754 0.13%	0.0404 0.36%	0.1574 0.11%	0.1952 0.33%	0.2566 0.28%	2.7724 0.49%	0.7103 0.13%	0.5733 0.41%	0.0162 0.0133
0.0893 0.16%	0.0603 0.10%	0.0322 0.20%	0.1252 0.14%	0.1562 0.11%	0.2571 0.12%	2.7730 0.14%	0.7135 0.20%	0.5716 0.19%	0.0166 0.0083
0.0694 0.18%	0.0468 0.11%	0.0250 0.22%	0.0974 0.46%	0.1213 0.18%	0.2562 0.66%	2.7805 0.23%	0.7123 0.52%	0.5723 0.34%	0.0106 0.0090
0.0553 0.30%	0.0374 0.23%	0.0199 0.17%	0.0774 0.37%	0.0969 0.38%	0.2573 0.41%	2.7766 0.54%	0.7149 0.22%	0.5710 0.48%	0.0155 0.0143
0.0442 0.14%	0.0298 0.13%	0.0159 0.47%	0.0620 0.27%	0.0773 0.19%	0.2570 0.64%	2.7765 0.42%	0.7139 0.31%	0.5717 0.18%	0.0085 0.0176
0.0353 0.09%	0.0238 0.10%	0.0126 0.30%	0.0496 0.43%	0.0616 0.17%	0.2548 0.23%	2.7949 0.23%	0.7121 0.45%	0.5739 0.18%	0.0086 0.0131
0.0177 35.13%	0.0123 42.03%	0.0068 41.23%	0.0201 0.53%	0.0331 42.04%	0.3381 41.50%	2.7779 1.36%	0.7109 0.46%	0.5709 0.27%	-0.0282 0.0255
0.0224 0.17%	0.0151 0.09%	0.0080 1.01%	0.0315 0.52%	0.0392 0.07%	0.2546 1.53%	2.8036 1.21%	0.7126 0.58%	0.5722 0.23%	0.0034 0.0388
0.0179 0.19%	0.0131 0.35%	0.0064 0.69%	0.0252 0.47%	0.0314 0.46%	0.2554 0.43%	2.7784 0.89%	0.7100 0.34%	0.5703 0.28%	0.0032 0.0073

## 6.2 The Loader Program

The purpose of the loader program is to load the key programs, the common subroutines, the star data, the site data, and the ETMS characteristic data, to provide an opportunity to modify any of these program constants, and then finally link in one of the major computer programs such as SITE PREP, MEAS, or REWORK. The annotated printout for the loader program appears with the SITE PREP program that follows.

## 6.3 The Site Preparation Program and Annotated Printout

One purpose of the site preparation program (SITE PREP) is to anticipate measurement conditions and to prepare the daily measurement tapes before traveling to a measurement site. The second purpose of the SITE PREP program is as an aid to double checking the measurement conditions after a site measurement analysis is finished and to provide a computer printout of the final measurement conditions in an easier to read format. An additional use of SITE PREP is to set up site parameters or error assumptions for a data rework.

The normal means of loading and using SITE PREP is covered on the annotated printout in section 11.2. At TRAP, option "3 = KEY LIST" prints out the key functions on this program, option "2 = LK MEAS" can be used to exit SITE PREP and link in the MEAS program, and option "3 = LK REWORK" can be used to exit SITE PREP and link in the rework program.

The major features available on SITE PREP are (1) Enter site data and sun/moon almanac data to be stored onto the daily MEAS cassette tapes, (2) printout of the site and star data for measurement documentation, (3) printout of expected/actual measurement conditions and errors using Cassiopeia A to measure G/T, (4) printout of measurement conditions using the alternate stars, Cygnus A, Taurus A, or Orion A, and (5) graph the elevation of Cas A, Cyg A, Tau A, Ori A, Sun and Moon, and tabulate the azimuth and elevation of Cas A versus Greenwich Mean Time (GMT).





## SITE PREP (cont)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

REWIND SITE PREP TAPE

\* INSERT APPROPRIATE RUN (MEAS) TAPE (either internal or external cassette)

CHANGE RUN/DATE/SITE; 1=YES; 2=NO; 3= 1 1 1

BOXES SHOW QUESTIONS BYPASSED  
IF "SPACE BAR", "EXECUTE"

```

RUN NUMBER(=NO)NOW: 3
YEAR(=NO)NOW: 1976-1977
MONTH(=NO)NOW: DEC-MAY
DAY OF MONTH(=NO)NOW: 2-210
DAY OF WEEK(=NO)NOW: THU-SUE
PROJ #(=NO)NOW: 276.54079276.5411
LOCATION(=NO)NOW: FT. DETRICK ANT #1 SCAMP ROBERTS, ANT#1
SITE:W. LONG(=NO): 77.418 -9120.753
SITE:N. LAT(=NO): 39.448 -135.754
SITE:ALT(M)(=NO): 0.107 -0.869

```

NEW F/BW/ELEV/HNT CONTROLS=10-11-87 M 91

```
CENTER FREQ(HZ)C (=NC): 7.382 7.55
ERR IN FREQ(S)C (=NC): 0.01 2
BANDWIDTH(HZ)C (=NC): 5.5 2
ELEV(DEC)C (=NC): 5 2
ANT DIAM (FT)C (=NC): 60 2
1=APR EFF,2=ANT HPBW,3=CHVL HPBW(=NC): 0 21
APERTURE EFFICIENCY(=NC): 0.65 2
HPBW ERR(1S,2C)C (=NC): 1.43 2
```

ANT\_PT\_ERP: 1=DEG, 2=ZHEBWA - NL: M 91

DEG(=40): 0.0129 7.015

ANT PT ERR corresponds to G/T data fit (3+15/50R(4PTS) of 0.128587804  
dB This information is important when SITE PREP is being used to recheck  
final results and you are trying to obtain a specific G/T data fit value.

0.128587894 DB:0=TRY AGAIN: =NO : 1 2

CHANGE: 1=T(K); 2=G/T(GB); 3=NC; 4

G/T(DB)=( =NC): 40.0999873 2

CHANGE: 1=G/TA, 2=TA(=NC): 0 21

G/TA(dB/K)(=NC): 32.74400707

AMBIENT TEMP(F) ( =NO): 80.3 9

DEW PT TEMP(F) ( =ND): 46.2 °F

ENTER SUN/MOON ALMINAC DATA(1=YES) -NO: 0 91

FOLLOWING INPUTS ARE IN 2 PARTS:1st=days,2nd=min

IF DEC IS South: enter deg and min **NEGATIVE**

SUN :GHA @ 0 GMT( =MC): 182.665 0180

MIN( =NC):	0	754.7
------------	---	-------

SUN	:GHA @ 12 GMT( =NO): 360.853	99
-----	------------------------------	----

MIN( =NC):	0	255.0
------------	---	-------

N.DEC @ 0 GMT( =NC): -21.9415 917

MIN( =NC):	0	731.9
------------	---	-------

N.DEC @ 12 GMT( =NO): 17.4596 217

MIN( =NC):	0	939.7
------------	---	-------

MOON : GHA @ 0 GMT( = HC ) : 54.55 0000

MIN(=HC): 0 938.1

MOON : GRA @ 12 GMT( =RC): 444.391 163

MIN( =NC):	0	238.7
------------	---	-------

N. DEC @ 0 GMT( =ND: 8.45

MINC = NC): 0 26.1 (negative sign on minutes is optional)

N. DEC @ 12 GNT( =NC) \* -9. 1953

MIN( =NC):	0	217.6
------------	---	-------

HOR PARALLAX( =NC): 0.9

MIN( =HC):	0	757.4
------------	---	-------

AGE (DAYS) = HCP: 11 029

PRT SLIP THE AUTHOR'S NAME IN THE SLIP

horizontal parallel is always less than 2 deg.  
So you inadvertently try to insert a value  $> 2$  deg.  
the calculator warns you to do better

SITE PREP (cont)

NBS1B.07 SITE PREP <D1-F12> T2-F12: X.94<0002>T2-4,D1-4

— 2 —

Exam # 6.09

2011 1

```

PROC 2Y6.5411      CAMP ROBERTS, ANT#1
TUE: 1977.000 10  ( 1977.358)
7.550 GHz, 60.0 F, DISH

```

G/Td	G/T
32.74 dB/K	40.10 dB/K

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

SITE: W. LONG	N. LAT	ALTITUDE	GHA TO ARIES @ 0 GMT
120.753 deg	35.734 deg	0.369 km	1227.680 deg
CC4	LC5	LC0	LC6

[illegible]

FLUX DATA

STAR	FLUX in F.U.	RANGE(GHz)	SIZE(min)	SPEC INDEX			
Epoch	Secular Decay			Secular Expansion			
String	$S(1)$	$T(1,10)/100$	$T(1,1)$	$T(1,2)$	$T(1,3)/100$	$T(1,4)/1000$	$T(1,7)/1000$
1 CAS A	3154 +- 4.5 % @ 1 GHz	1 TO 10	4.60	-0.792 +- 0.036			
1965.0	0.97 +- 0.05 %/Yr						
2 CYG A	2250 +- 4.5 % @ 1 GHz	2 TO 10	1.60	-1.090 +- 0.020			
3 TAU A	1024 +- 4.5 % @ 1 GHz	2 TO 10	4.00	-0.263 +- 0.020			
4 ORI A	420 +- 4.5 % @ 3 GHz	3 TO 10	3.50	0.000 +- 0.005			
5 SUN	325000 +- 7.0 % @ 1 GHz	1 TO 10	32.00	2.000 +- 0.005			
6 MOON	1881 +- 3.9 % @ 2 GHz	2 TO 10	32.00	2.000 +- 0.000			

## PROC CONSTS

N	T(N,1)	S(N,1)	T(N,8)	T(N,19)	T(N,19/20)	T(N,9)	T(N,6)	T(N,7)
	T(N,15)	T(N,16)	T(N,17)				T(N,4)	T(N,5)

## LOCATION &amp; MISC DATA

STAR EPOCH	(DAYS AFTER 1977.0)	SOLAR EPOCH	(DAYS AFTER 1977.0)
1977.358	130	1976.923	-29

STAR:	RT.ASC	N. DEC.	LINEAR POLZ		POLZ ANG	
SOLAR:	GHA @ 0 GMT	N. DEC @ 0	GHA/Hr	N. DEC/Hr	HOR PRLX	PHASE
1 CAS A	350.59 deg	58.69 deg	1.5 +- 0.0 %	0.0 %	40.0 +- 0.0 DEG	
2 CYG A	299.67 deg	40.66 deg	9.0 +- 0.0 %	0.0 %	146.0 +- 0.0 DEG	
3 TAU A	83.28 deg	22.00 deg	7.0 +- 0.0 %	0.0 %	143.0 +- 0.0 DEG	
4 ORI A	83.53 deg	-5.40 deg	0.0 +- 0.0 %	0.0 %	0.0 +- 0.0 DEG	
5 SUN	180.91 deg	17.53 deg	15.000 deg	0.011 deg	0.000 deg	0 day
6 MOON	269.64 deg	-11.10 deg	14.501 deg	0.151 deg	10.957 deg	22 day

PROC CONSTS

N	T(N,1)	S(N,2)	S(N,3)	T(N,11)	T(N,12)	T(N,13)	T(N,14)
---	--------	--------	--------	---------	---------	---------	---------

# SITE PREP (cont)

NBS1B.07 SITE PREP 01-F17 T2=1 N.04.000212-4.D1-4

SYN # 6.09 N(1,4)

RUN 1 H6

PROG 270.5411 CAMP ROBERTS, ANT#1  $\rightarrow$  P#  
 TUE: 1977 MAR 15 1977.358-C  
 F 7.550 GHz 60.0 Ft DISH  
 G/Ta G/T  
 32.74 dB/K 40.10 dB/K  
 10\*L6T (G/H9) 10\*L6T (G/T)

TYPICAL VALUES for G/T MEASUREMENT using CAS A

G	T	APER EFF	RAU EFF	ANT HPBW	CONVL HPBW	EFF AREA
61.34 dB	133.1 K	0.6500	0.98	0.1371 deg	0.1382 deg	170.8 m <sup>2</sup>
10*L6T G	T	B2	B3	B0/60	B/60	B9

Antenna Elev = 5.0 deg L

PARAMETER				ERR TO G/T	
F	FREQUENCY (GHz)	F 7.550 +- 0.01 % F0		+-	0.00 % E0
S	FLUX (F.U.=10 <sup>-26</sup> W)	S(1,4) 82.3 +- 5.90 % S		+-	5.90 % S
	T(ant) = 24.8 K (Y-U)*T				
	X1 = 1.822E-05 K (Y-U)*T/G				
Y	Y-FACTOR	Y 1.186 +- 0.10 % C8		+-	0.64 % C0*Y5
	Y(dB) = 0.742 dB 10*L6T Y				
K1	ATM ABSORPTION FACTOR	K1 0.910 +- 4.95 % E1		+-	4.95 % E1
	oxygen attn = 0.0294 dB G4*L4				
	water attn = 0.0063 dB 5*L5+G6*L6				
	water dens = 7.8 g/m <sup>3</sup> L7				
	atm bright = 25.2 K B4				
	site alt = 0.369 km C0				
	amb temp = 80.3 F A(3)/10				
	dew point = 46.2 F A(4)/10				
K8	DIFFUS+ 0.15*(1/K2-1) D8	K8 0.982 +- 12.03 % E8		+-	12.03 % E8
K9	REFRAC+ 0.18*(1/K9-1) D9	K9 0.976 +- 0.45 % E9		+-	0.45 % E9
	1st const: 1.0155 L8				
	2nd const: 0.0130 L9				
K2	STAR SHAPE (CAS A) D1	K2 1.900 +- 1.14 % E2		+-	1.14 % E2
	+-(P/10.4*(1-K2)+0.1) D2				
	HPBW (+- 1.43% D2				
K3	ENDWD EFFECTS FACTOR	K3 1.000 +- 0.00 % E3		+-	0.00 % E3
	bandwidth = 5.5 W MHz				
K4	DIFF SYSTEM TEMP D5	K4 1.000 +- 0.07 % E4		+-	0.07 % E4
K5	ANT POINT(+ 0.0150 deg) K5 1.000 +- 3.01 % E5			+-	3.01 % E5
	or G/T data fit = +- 0.129 dB H1				
K6	ANT POLARIZATION FACT	K6 1.000 +- 0.35 % E6		+-	0.35 % E6
K7	SYSTEM RESPONSE FACT	K7 1.000 +- 2.63 % E7		+-	2.63 % E7
	instr pur resp (+ 0.20 dB) C9				
	Y/(Y-1) = 6.365 Y5				
	quass curve fit (+ 2.80 dB) A2				
Ta	ADDED NOISE (K)	H9 723.8 +- 0.60 % D3		+-	0.60 % D3
TOTAL ERROR: quad sum + diffn & refr err				+-	21.19 %

# SITE PREP (cont)

STORE 9,T,N:0=NO,5=ENT,10=INT,=N: 0 210 ← STORES SITE DATA onto RUN(MEAS) tape  
 LIST ALTERNATE STARS:0=NO,21 ← normally bypass this listing

NBS18.07 SITE PREP D1-F12 T2-F12 X.04.0003 2-4,01-4

-4-

System # 6.09

RUN 1

PROG 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAY 10 ( 1977.358)  
 7.550 CH: 69.0 Ft IISH

G/T<sub>0</sub> G/T  
 32.74 dB/K 40.10 dB/K

STAR	FLUX in F.U.	T(ant)	K2	Y-factor	Y(dB)	X(K)
1 CAS A	582 +- 5.8 %	24.80 K	0.900	1.1864	0.74 DB	1.822E-05
2 CYG A	248 +- 8.8 %	11.40 K	0.986	1.0857	0.36 DB	8.376E-06
3 TAU A	602 +- 8.8 %	26.16 K	0.923	1.1966	0.78 DB	1.922E-05
4 ORI A	420 +- 5.0 %	18.54 K	0.940	1.1393	0.57 DB	1.312E-05
5 SUN	2E+07 +- 8.1 %	1.01E+05 K	0.900	1.1864	0.74 DB	1.822E-05
6 MOON	26805 +- 9.9 %	145.92 K	0.900	1.1864	0.74 DB	1.822E-05

WHEN K2 < 0.8, REST OF PRINT OUT IS MEANINGLESS

G/T or G/T<sub>0</sub> MEASUREMENT ERRORS: ELEV= 5.0deg

	CYG A	TAU A	ORI A	SUN	MOON
E-S FLUX	8.80 %	8.80 %	5.00 %	8.10 %	9.90 %
E-F FREQUENCY	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
E-Y Y-FACTOR	1.37 %	0.61 %	0.82 %	0.16 %	0.19 %
E-K1 ATM TRANS FACT	4.95 %	4.95 %	4.95 %	4.95 %	4.95 %
E-K2 STAR SHAPE	1.14 %	0.24 %	0.90 %	0.72 %	0.45 %
E-K3 BANDWIDTH EFFECTS	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
E-K4 DIFF SYST TEMP	0.16 %	0.06 %	0.09 %	0.00 %	0.01 %
E-K5 ANTENNA POINT	3.01 %	3.01 %	3.01 %	3.01 %	3.01 %
E-K6 ANT POLARZ	0.35 %	0.35 %	0.35 %	0.35 %	0.35 %
E-K7 SYST RESPONSE	3.42 %	2.60 %	2.82 %	2.31 %	2.33 %
E-K8 ATM DIFFUS	12.03 %	12.03 %	12.03 %	12.03 %	12.03 %
E-K9 ATM REFAC	0.46 %	0.46 %	0.46 %	0.46 %	0.46 %
E-T <sub>0</sub> NOISE AID	0.60 %	0.60 %	0.60 %	0.60 %	0.60 %
TOTAL LINEAR SUM	36.17 %	33.70 %	31.82 %	35.62 %	21.88 %
TOTAL QUADRATIC SUM	16.46 %	16.23 %	14.61 %	15.82 %	13.88 %



# SITE PREP (cont)

ELEV vs GMT PRINT OUT (J=YES) = NO: 0 91

NBS1B.07 SITE PREP D1-P12 T2-P12: X.04-0002>T2-4,D1-4

S/sa # 6.09

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RUN 1

PROG 275.5411 CAMP ROBERTS, ANT#1  
TUE: 1977 MAR 10 1977.353  
7.550 GHz 60.0 Ft DISH

G/Ta G/T  
22.74 dB/K 40.10 dB/K

# = CAS A  
o = MOON

x = CYG A

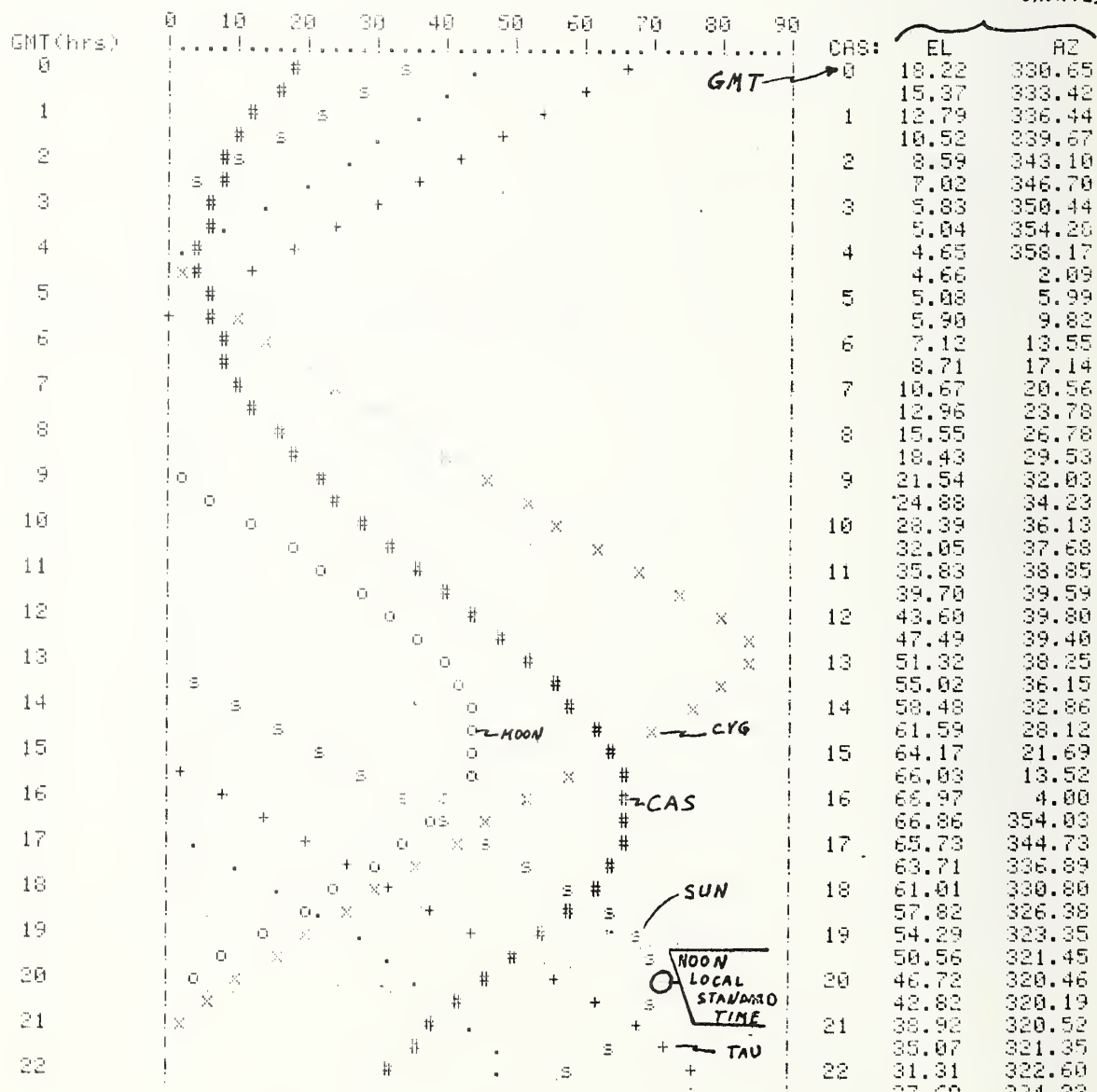
+ = TAU A

. = ORI A

s = SUN

SOURCE ELEV(deg)

CAS A ANTENNA  
POINTING COORDINATES





#### 6.4 The MEAS Program and the Summary Data Tape

The purpose of the measurement program is to collect and validate data to be used in the rework program. The measurement program collects three types of data: sky profile data; star cuts used to measure  $G/T$ , antenna half power beam width (HPBW), and  $G/T_a$ ; and satellite power data used to calculate  $C/kT$  and EIRP.

##### 6.4.1 The Standard Check, and Providing the Proper Measurement Conditions

Periodically throughout all of the measurement routines contained in the ETMS program MEAS, a check procedure is initiated to verify that the proper measurement conditions exist for a valid measurement, and to provide documentary evidence that the ETMS is operating satisfactorily. The standard check contains 9 pieces of information labeled as follows: BRG PWR, BRG PWR+a, PWR+a/STD, STD, Ta#, MANL, PRGM, STD CK, and FLTR.

##### 6.4.1.1 Meaning of Labels, and Normal Conditions

BRG PWR is the power incident on the NBS type IV power bridge due to the output of the earth terminal after being attenuated, amplified, and filtered through the ETMS control unit when the standard attenuator is out, and both microwave noise add noise sources are off. For normal operating conditions, this power level is between 0.66 mW and 0.48 mW if BRG PWR is greater than BRG PWR+a; otherwise BRG PWR should be greater than 0.12 mW.

BRG PRW+a is the power incident on the NBS type IV bridge due to the output of the earth terminal passing through the ETMS unit under the same conditions as for BRG PRW except that one or both of the microwave noise add sources are commanded ON, and if PRW+a/STD = 1, then the signal has been attenuated by the standard attenuator. Which noise add sources are commanded ON is indicated under Ta#. If Ta# = 1, then only noise add #1 is commanded ON. If Ta# = 2, then only noise add #2 is commanded ON. If Ta# =  $\emptyset$ , then both noise add #1 and noise add #2 are commanded ON. For normal operating conditions, the BRG PWR+a power level is between 0.66 mW and 0.48 mW unless BRG PWR is greater. In the latter case BRG PWR+a should be greater than 0.24 mW.

STD is the assumed absolute attenuation of the standard attenuator (i.e., STD = 4 implies a 6.02 dB standard attenuator).

MANL is the attenuation of the manual input attenuator in the "ETMS control unit." The value of the manual attenuator is entered via the calculator keyboard. There is no computer read on the input attenuation value, so the operator must be careful to record any change. This is done via the special Key 15. Normally the MANL attenuator is adjusted so that the program attenuator is reasonably away from its extreme attenuation limits (viz., 0 dB and 15 dB).

PRGM is the attenuation of the program attenuator in the "ETMS Control Unit." This value is set by the calculator in an attempt to keep the input power levels in the normal range.

STD CK is the measured attenuation minus the assumed attenuation of the standard attenuator contained in the ETMS control unit. On the average the absolute magnitude of STD CK is normally less than 0.02 dB but because noise signals are used in the test it will sometimes be as great as 0.05 dB.

FLTR is a number which indicates which filter is being used within the "ETMS Control Unit." The nominal identification of the filters is as follows:

<u>FLTR Number</u>	<u>Center Frequency</u>	<u>Bandwidth</u>
1	30 MHz	2.5MHz
2	70	1
3	70	2.5
4	70	5.5

#### 6.4.1.2 Adjusting STD CK

It is important that the assumed magnitude of the standard attenuator (A3) is close to the true value because the standard attenuator is inserted each time the noise add is turned on in order to keep the type IV power bridge in its most accurate range. Thus to have an accurate knowledge of the earth terminal signal plus noise add power, the assumed attenuation of the standard attenuator must be accurate. STD CK is the best overall indicator of the "health" of the measurement process. The STD CK can fall out of normal because the attenuation of standard changes due to temperature changes, or because the two relays that switch the standard attenuator become faulty, or because the RF control unit amplifiers are nonlinear, or the earth terminal gain is unstable during the measurement cycle, or any other number of reasons.

There is provision in the EQUIP CHECK program to adjust the value of A3, but if while using the MEAS program the average STD CK should be adjusted closer to zero, I suggest the following procedure. (1) Stop the program (e.g., pressing the END key on the calculator keyboard), (2) via the keyboard enter A3 (i.e., press key "A," then key "3," then the key "EXECUTE"). In the computer display will be the current value of A3, (3) press key "RECALL." In the display should appear "A3." (4) Press key "=", then enter the new value you wish for A3 and press "EXECUTE." STD CK is the measured value minus the assumed value of the standard attenuation expressed in decibels, so if the STD CK is averaging say 0.1 dB, then you would want to increase A3 by 2.3% (i.e., if originally A3 = 4.000, then new A3 = 4.092). (5) To check the new value of A3, add the following program to the end of the existing program.

```

9000 Q = FND0 + FND1
9010 Q = FNU1
9020 Print
9030 go to 9010

```

(6) The program in (5) repeatedly runs the standard check. To use it you enter via the keyboard "CONT 9000," then press "EXECUTE." When you are satisfied of the new average value for STD CK, press the key "STOP" twice. If the new STD CK average is satisfactorily close to zero, you can erase your temporary program by entering "DEL 9000," then press "EXECUTE." Otherwise repeat steps (1), (2), (3), (4) and (6).

#### 6.4.1.3 "NOT NORMAL" Display

If during the standard check one of the measurement conditions is not normal, then the computer will stop with the display "NOT NORMAL (1=ADJT) (= NC):0?" Specifically, one of the following conditions is not met.

- (1) PRGM between 2dB and 10dB
- (2)  $(\text{BRG PWR} + a) / (\text{BRG PWR}) < 4$
- (3)  $(\text{BRG PWR}) / (\text{BRG PWR} + a) < 4$
- (4)  $\text{STD CK} < |0.05\text{dB}|$

If the operator chooses to continue with the conditions "as is," then he presses the space bar, then "EXECUTE." On the other hand, if he wishes to correct the operating condition, he enters "1," "EXECUTE." The operator will then be given an opportunity to change (a) the value of the ETMS input attenuator, (b) the



noise add source, and/or (c) whether the standard attenuator is inserted when the noise add source is turned on.

<u>Condition Not Met</u>	<u>Changes to Consider</u>
1	a
2 or 3	b,c
4	change A3 (see §9.1.2)

6.4.2 Establishing the Antenna Biases

The G/T measurement routine does not operate well unless the star center prediction is well within the half power beamwidth (HPBW) of the antenna. This normally requires that the computer-predicted azimuth and elevation angles be biased in order to obtain the needed earth terminal azimuth, elevation command angles. The need for the bias corrections is due to an unknown mix of situations such as antenna bore sight errors, elevation dependence feed sag, atmospheric refraction errors, errors in the site coordinates, and error in time. The first step is to find the star.

6.4.2.1 Finding the Star

With the ETMS connected to a down converter output of the earth terminal, adjust the ETMS input attenuator with the meter bypass in the BYPASS position until the output meter is midscale (at 0) on the meter x 1 scale. Then switch the meter scale to x.1 and with the meter offset knob recenter the meter reading. If any of the four pointing biases (hour angle, declination angle, azimuth, or elevation) are currently in the program, it is usually best to zero them using special function Key 5. Next press special function Key 4 and start the star fix routine (normally for star #1 = Cas A). This routine displays the predicted azimuth and elevation angle for the star, and this prediction is updated about every 10 seconds. Command the antennas to the predicted pointing angles adjusting the meter offset or sensitivity as needed; search for pointing angle which gives the maximum star output. Compare the antenna pointing position readout with the predicted pointing. Stop the star fix routines by pressing the "STOP" key twice; insert the appropriate AZ and EL biases via Key 5. Again restart the Star Fix routine (Key 4) and verify that the antenna pointing position indicators agree with the biased pointing prediction displayed by the ETMS.

#### 6.4.2.2 What to Do if You Cannot Find the Star

If for some reason you cannot find the star using the above routine, try the following check list.

(1) If the antenna elevation angle is below 15 degrees, and there are unusual atmospheric conditions, the refractive corrections may be incorrect, or if there is an obstruction in or near the line of sight, switch to a star with a larger elevation angle. (2) Check that the earth terminal down converter output is connected to the ETMS control unit input. To double check, turn on and off noise add #1 (via keyboard, FNX82 and FNX83, or via program switches, 82 and 83) and observe change in ETMS output meter. (3) Compare the predicted Cas A azimuth and elevation angles with those generated before the trip with the SITE PREP Program. If an obvious difference exists, the wrong site data may have been entered, or perhaps there is a computer load problem. If it looks like a computer load problem, turn the calculator off, and start up all over again. (4) Check that the time is correct. The clock should read Greenwich Mean Time, not local time. The date from which the star positions are calculated is the date in the page heading, not the one set in the clock unit, and it should be the proper day in Greenwich, England. To double check that the correct date is in the calculator, gain keyboard control of the calculator (denoted by the lazy T in the display), enter "C6," press "EXECUTE." In the display will be the Greenwich hour angle (GHA) to Aries at 0 GMT expressed in decimal degrees. Using "The Nautical Almanac" or "The Air Almanac" of the proper year, look up the GHA to Aries at 0 hr GMT. In the Almanacs this will be expressed in degrees and decimal minutes. Divide the decimal minutes listed in the Almanac by 60 and add to the listed degrees to obtain GHA to Aries at 0GMT expressed in decimal degrees. This should agree with the computer constant C6; if not double check the value obtained in the Almanac. If they still disagree, the wrong site data was loaded. If only the day is incorrect, you can correct the computer value of C6 ("RECALL," "=", enter new value, "EXECUTE," or "C6 = "--.---," "EXECUTE") and look for the star again. (5) Check that the site coordinates are correct. In a manner similar to (4) above, check the computer constants C4 = West Longitude of the site in decimal degrees, and C5 = North Latitude of the site in decimal degrees. If the site is at East of the zero Longitude, C4 should be a negative number. If the site is South of the Equator, C5 should be negative.

#### 6.4.3 Sky Profile

The sky profile option is selected at TRAP via option lSKY. A sky profile is a series of sky temperature measurements made at various elevations along the path that Cas A will take. The measurement results are then least squares fit to a constant plus a cosecant of elevation term. The purpose of the sky profile is threefold. First, it yields information concerning atmospheric loss. Secondly, the curve fit parameters are used to correct for the change in sky background temperature as the various star cuts are taken to determine G/T. Lastly, the sky profile results are used to identify when any unusual changes in atmospheric conditions occur.

#### 6.4.4 The G/T Measurement

Before the G/T measurement routine can succeed, the ETMS manual input attenuator needs to be properly set, the noise add sources functioning appropriately, and the antenna bias corrections established as discussed in the preceding paragraphs. Once this is done, the G/T measurement routine is initiated by selecting the "2G/T" option at TRAP. One measurement set consists of 6 cuts. For the first cut, the antenna is pointed and braked at the cold sky two degrees offset from the path of Cas A. A "cut" consists of approximately 30 sequential power measurements taken at six-second intervals on the output of the earth terminal. The purpose of the sky cut is to compare the current sky temperature with the earlier sky profile results. This helps identify atmospheric changes and/or interference situations.

For the remaining 5 cuts, the antenna is pointed to a computed coordinate position so that the radio star Cas A drifts through the antenna beam in equidistant, spaced cuts. After each cut, a parabolic curve is fit to those measurement points when the radio star is predicted to lie between the half power beam width (HPBW) points of the antenna pattern. Cas A will remain between the HPBW points for 11 successive measurements (66 seconds of time). These eleven points are curve fit to a parabola, and the discrepancy between the time the star was predicted to be centered in the antenna pattern and the time the star was actually centered is used to calculate and print out the equivalent antenna hour angle offset. If it is desired that a new hour angle bias be entered for improving the predicting of the time of the star maximum, Key 5 is pressed and the new hour angle bias entered. The hour angle bias (or declination angle

bias) can be entered at anytime without invalidating the measurement data. Remember however, azimuth or elevation biases can only be entered between measurement sets; otherwise the antenna declination offsets between cuts are incorrectly calculated and the two-dimensional curve fit to the data is incorrect, which invalidates the entire measurement set.

After the last cut in a measurement set, the calculator fits a parabola to the maximum of the prior store cuts versus declination offset from the unbiased predicted star center. The difference between the unbiased predicted declination angle for a star maximum and the actual declination angle for the star maximum is printed out. If it is desired that a new declination angle bias be entered for improving the biased prediction of the declination angle for star maximum, Key 5 is pressed and the new declination angle bias entered. The declination angle bias (or hour angle bias) can be entered at anytime without invalidating the measurement set (but remember - do not change an azimuth or elevation bias during a measurement set). It is best to wait until the measurement set is stored on magnetic tape before changing the declination bias. If the bias is changed before the measurement set is stored, the most graceful way to continue is to press Key 10 (shift plus  $f_0$ ) to store the data.

When all the data for a particular run have been taken, Key 19 (Last Meas) is used to store the summary information and the computer program. When all the information has been stored onto the cassettes, NBS recommends the computer program be listed out.

After the program is listed out, the rework program can be loaded at TRAP using the option "4LNK."

#### 6.4.5 The EIRP and C/kT Measurement

The EIRP or C/kT measurement is initiated by selecting the "3 EIRP" option at TRAP. The EIRP or C/kT measurement routine uses measurement of power at a point in the satellite spectrum free of signals within the bandwidth selected, and a measurement of power with the satellite signal centered in the ETMS filter bandpass. The narrowest filter provided has a nominal bandwidth of 1 MHz. The measurements of EIRP and C/kT were not specified as being part of the ETMS package, and these measurements have not been engineered nor programmed for the inexperienced metrologist. The program that exists was developed to collect sufficient data for NBS metrologists for accurate measurements of EIRP and C/kT,



but the accuracy considerations and the measurement precautions required for accurate EIRP and C/kT measurements are not dealt with in this manual.

#### 6.4.6 Data Storage on the Run Tape, and the Summary Tape

Ideally, each set of measurement data is recorded twice, once on the run cassette tape (which contains the MEAS program) and secondly on the summary tape. The run tape has the measurement program, the site data, the star data, the measurement conditions, and all of the measurement results for one particular run all recorded on it, and it is intended to be an archives tape which is write protected as soon as a run is finished. In contrast, the summary tape is a working tape. The measurement data from several runs can be accumulated onto the tape, and the rework program updates the summary tape files with the latest results.

The particular file on the run tape on which data is stored depends on the set number (computer variable is N7). In turn, N7 is determined by the run number (computer variable is N) which is controlled by the ETMS operator. It is possible to overwrite a "run" data file by intentionally or inadvertently re-using a series of N values.

The summary data tape files are filled sequentially. Every store operation is stored in the next available file.

The reason for storing the data twice is to avoid losing data when cassette recording errors are encountered (ERROR 59). This occurs because of a flaw in the tape, or unclean recording head, or other causes. If the problem occurs during the read operation, the file can sometimes be recovered by cleaning the read head and then rereading the file, but usually that data file is lost.

#### 6.4.7 Changing the Run or Summary Data Tapes

When the run tape or summary tape data files are full, the operator is notified and the program automatically performs the "Last Measurement" routine of storing the summary data, etc. To continue on with the measurement process without reloading the MEAS program, a new run and/or summary tape needs to be inserted and the appropriate changes made to the computer variables so the data store locations will be appropriate for the new tape. Whenever insertion of a new run or summary tape is desired, the "5 NEW TAPE" option is selected at TRAP (e.g. Key Ø) and the appropriate entries made in response to the computer-generated questions.



#### 6.4.8 The Use of the Special Function Keys

In the MEAS program, the special function keys found in the upper left-hand corner of the calculator are important for the normal operation of the measurement. The ten special function keys are labeled  $f_0, f_1, \dots, f_9$ . Twenty special functions are available by using the above keys in conjunction with the shift key. A special function can be activated anytime the calculator is stopped (by pressing the stop key) or waiting for an input.

For convenience, the routine activated by pressing  $f_0$  is denoted as Key  $\emptyset$ , and so forth through Key 9. Key 10 is the routine activated by pressing the shift key and the special function key  $f_0$ , and so forth through Key 19. The routines associated with the special function keys for the MEAS program are described in the following paragraphs.

Key  $\emptyset$  sets the MEAS program to "the restart alternative position" TRAP, namely the position in the program that chooses the major program option. The options in the MEAS program are " $\emptyset$  MASTER RESTART," which is used to initialize certain program constants. These constants need only be initialized once, and this is done automatically when the program is loaded. " $\emptyset$  MASTER RESTART" is used primarily for the case when the calculator gets hung up waiting for a return flag from the digital voltmeter. This is a calculator quirk that sometimes occurs on the first command to read the voltmeter. The operator is warned of this problem on the printout so no special concern for this option is necessary. The "1 SKY" option initiates the sky profile measurement routine, "2 G/T" initiates the G/T measurement routine, "3 EIRP" initiates the EIRP, C/kT measurement routine, "4 LNK" deletes the MEAS program and links in REWORK program, and "5 NEW TAPE" changes the calculator constants to store data to the proper files on a new tape.

Key 1 is used to restart a "cut" in the G/T measurement routine. This key typically is used after the operator realizes he has missed the antenna pointing and needs to start the measurement over again.

Key 2 is used to restart a measurement set in the EIRP measurement routine.

Key 3 is used to refit a parabola to the results of a set of five cuts. This key is used when for some reason one of the measurement cuts is replaced and there is no need to remeasure the remaining cuts.

Key 4 initiates the star fix routine, and Key 5 is used to enter new antenna biases and is discussed in paragraph 9.2.

Key 6 is used to enter into the computer program a change in the ETMS input attenuator or a change in the filter being used.

Key 7 is used to change the estimated magnitude of the noise add reference,  $T_a$ , which changes the scale factor for the data collecting graphs.

Key 8 is used to change the estimated value for the system temperature relative to the noise add reference,  $T/T_a$ , both its zenith value, and the coefficient of the cosecant of the elevation angle.  $T/T_a$  determines the zero values for the data collecting graph. Because  $T/T_a$  is calculated automatically from the sky profile measurement, and because the zenith value of  $T/T_a$  is recalculated after each cold sky cut, there is not much reason to reenter a new value. However, when the measurement frequency is changed,  $T/T_a$  can be somewhat in error, and sometimes it is convenient to manually correct the value.

Key 9 is used to change whether the 6 dB standard attenuator is switched in when the noise add source is on.

Key 10 is used to store a partial measurement set. For example, a single additional cold sky cut may be taken for a record concerning the atmospheric conditions.

Key 11 is used to store the star and site parameters, and the current measurement program onto the run tape. Key 12 stores the summary data matrix M, and the program constants matrix N onto the summary data tape.

Key 13 is used to list out all of the data contained in the data summary tape. Key 14 is used to list out the data contained in the current data matrix D.

Key 15 is used to enter a new measurement frequency and corrects the frequency dependent parameters such as star flux.

Key 16 is used to change the number of points used in the parabolic fit routine. For Cas A, 11 points are normally used. Because the fitting routine works best when the star is between the HPBW points, fewer points are used for other stars.

Key 17 is used primarily as an alternate way to calculate the magnitude of the noise add,  $T_a$ , which in turn adjusts the scale factor of the data collecting graphs. Because the magnitude of  $G/T_a$  is calculated after one measurement set is finished, this value of  $G/T_a$  can be entered via Key 17 and used to calculate  $T_a$  by using a value for the antenna gain based on the antenna diameter and the operating frequency.

Key 18 is used to change whether noise diode #1, diode #2, or both diodes are used for the noise add signal.

Key 19 is used when the last measurement data have been taken for a particular run. This key starts a routine which stores the summary data, and the current programs onto the run and summary data tapes.

#### 6.4.9 MEAS Annotated Printout

The annotated printout for the MEAS program follows. As usual, the MEAS program is loaded by the LOADER program, which is also included here.

# MEAS

\* INSERT RUN (MEAS) TAPE INTO INTERNAL CASSETTE

LOAD

RUN IDENTIFIES TAPE LOADED

PRINT ALL ON (1=YES) 01

MEAS SITE DATA (10=INT, 5=EXT) 95

PRGM CONST CHANGE OPTION (0=NO) 90

5.2

NOT NORMAL

ERROR 39 IN LINE 4150 ← DIRTY READ HEAD, Cleaned head  
 FETCH4150 ← LOOKED AT PRGM STEP TO BE SURE WHAT THE TROUBLE WAS  
 CONT4150 ← RETRIED TO LOAD, IT WORKED!!

(76.1024 0.14)  
 NBS1A.04 LOADER <D1-F0> T2-F0: 8.05 <D1-4> T2-4

Sysm # 6.09

-1-

RUN 2

PROG 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAY 10 (1976.470)  
 7.551 GHz, 60.0 Fw DISH

G/Ta G/T  
 34.15 dB/K 40.83 dB/K

PROG CONSTS

A2: 2.3	A3: 4.074	A4: 6.09
A5: 6.24	A6: 0.32	A7: -17.55
B2: 0.65	B3: 0.98	B5: 0.190451
B6: 7.59224E-03	B9: 170.827	B : 8.22544
C1: 4.54300E+18	C2: 1	C4: 122.03
C5: 37.38	C6: 270.302	C7: 0.23
C8: 0.1	C9: 0.2	C0: 6.00000E-03
C : 1976.47		
D1: 0.1	D2: 6	D3: 0.6
D5: 0.015	D8: 0.75	D9: 0.18
D0: 0.0157845	D : 60	
F0: 0.01	F : 7.551	
G4: 6.53155E-03	G5: 1.11238E-03	G6: 3.01622E-03
G : 1361870		
H1: 0.8	H5: 1	H9: 523.6
L5: 2.09331	L6: 2.17	L7: 10.1245
L8: 1.11961	L9: 0.013	L : 5
M5: 4.779	M6: 0.973	M7: 1.957
M8: 3.924	M9: 7.949	M0: 6.1
M : 12234.8		
N1: 6	N6: 2	N7: 500
N : 1		
O1: 3.552	O4: 2.56	O6: 1.25
O9: 5.634		

## MEAS (cont)

P1: 2.875  
P9: 4.053

F4: 5.014

Page 5.67

06: 0.063

Q7:  $1.76 \pm 0.00E-03$

09: 4.719

$P(\bar{Y}) = 0.2463$

$$T = 111.311$$

4 5 5

[မြန်မာ့နိုင်ငံတော်](#), [ပြည်ထောင်စု](#), [အုပ်ချုပ်ရေး](#), [ကျန်းမာရေး](#), [ပညာရေး](#), [ကဏ္ဍဆိုင်ရာ](#), [လူမှုဝelfare](#)

## IF HARDWARE HANGS UP

(1) STOP+STOP  
(2) KEY 0  
(3) 0 (FSTRT)

SUN TAPE EXT, MEAS INT( =MC): 1 2

REMEMBER TO USE BREAK POINT SET  
ON ETMS CONTROL UNIT TO SET  
ANTENNA DELAY TIME

SET AND DELAY @ BPK PTS:NON 48 ← SEC(1)=REREAD) (=NC): 0

ADD 24hrs TO CLOCK READ(=YES) =NO: 0      24-The program automatically adds  
24hrs to clock reading when clock passes from 24hrs to 0 hrs. This step allows  
you to remove this 24 hr addition in case the program was loaded the night before.  
FLTR:1=2@30,2=1@70,3=2@70,4=5@70( =NO: 4      94  
ENDL    91HNP(1) =NO: 45      93  
Use OASRT to reach  
- this statement.

FLTR:1-2030,2-1070,3-2070,4-5070(=H):4 94

MAIL ADDRESS: BOX 65

```
NOISE_RUB: b-#1?#2, 1=#1, 2=#2) = NC): 6 20
```

```
INSERT SUB WHEN (1 (ADD) C = HL): 1 2
```

TEMP. HUND: 0=HOLD, 1=MAN ( =NC) : 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036

THIS STATEMENT IS THE  
"RESTART POSITION"

19H, 2G, 3EIRP, 4LHK, 5NEW TAPE, OK, [REDACTED] =NO: 2

```
SOURCE:CHL AC HL:2 1 0
CAS #1: SET#0 -HC0: 1 0
```

IF TEMP, DEW POINT PROBE NOT  
WORKING, e.g. TEMP below freezing,  
can put Temp, humidity in by keyboard

```
SKY:GMT(HRS);START,STOP,STEP?4,6,1
```

CLOUDS(0 TO 9)=RAIN(0)=HC(0)=0 ?  
WIND (MPH)(0)=HC(0)=0 ?

76 1024 8.20)

HB510.95 DEAS 101-F14 13-F13: 2.05 101-F 12-F



# MEAS (cont)

Slam # 6.09

(2-

RUH 2

PRG 276.5411 CAMP ROBERTS, AHTA  
TUE: 1977 MAY 10 (1976.479)  
7.551 GHz, 60.0 Ft DISH

G To G/T  
34.15 dB/K 40.88 dB/K

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
88.9 F	45.1 F	28.6 %	7.4 g/cm <sup>3</sup>	0	0 mph

NOT NORMAL

ERROR 103 IN LINE 4615 ← THE IRI READ to the DVM often goes astray  
as we see below, V9 wasn't read properly  
FETCH4615  
4605 Q=V9\*(2\*V-V9)/Q1\*AC[7]/1000;J

\*VIA KEYBOARD

V9, V, Q1, A(?)	J	2.4878	-2.48780E-06	490	0.331576610
Q	EV			CA(?)	J

\*VIA KEYBOARD

END0+END1+END2 ← THIS IS A GOOD KEYBOARD COMMAND TO CLEAR "FUNNY" FLAGS  
AND THEN MEASURES POWER.  
1.214415425

\*PRESS KEY Q

← MW of power at the NBS TYPE III BRIDGE

1SKY, 2G/T, 3EIRP, 4LNK, 5NEW TAPE, 6RSTRT, =NC): 1 ?  
SOURCE: CAS AC =NC): 1 ?  
CAS A: SET#( =NC): 2 ?  
SKY: GMT(HRS); START, STOP, STEP?4, 5, 1

CLOUDS(0 TO 9=RAIN)( =NC): 0 ?  
WIND (MPH)( =NC): 0 ?

# MEAS (cont)

NES10.05 MEAS (76 1024 8.24)  
 D1-F14 T3-F12: 11.05 (D1-4/ T2-4)

System # 6.09

-3-

RUN 2

PROG 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAY 10 1976.4700  
 7.551 GHz, 60.0 Ft DISH

G/Ta 34.15 dB/K G/T 40.88 dB/K

TEMP 80.6 F DEW PT. 45.2 F REL HUMID 28.8 % WATER LENS 7.5 mm/at3  
 CLOUD COVER 0 WIND 0 mph

BRG PWR 0.4900mW BRG PWR+0 0.3327mW PWR+0 STD? 1 STD 4.0740 Ta# 0 MANL 2dB PRGM 4dB STD CK 0.0010dB FLTR 4

GOOD RANGE

NORMAL SETTING  
 (i.e. throw in 6dB when necessary)  
 SET # 2

GOOD RANGE  
 otherwise adjust manual atten

good!  
 less than 0.03  
 or change A3 via keyboard

AZ	EL	GMT	T/Ta
18.9595007	11.19171132	READY?	
25.48772690	15.69755805	READY?	0.568952886
31.12720388	21.36047576	READY?	0.565285416
			0.567557997

usually 8 or ten readings spaced to cover the elevations of interest (SEE SITE PREP plot)  
 $T/Ta = 0.5644 + 0.0007/\sin L$

# MEAS (cont)

15014 1 LE1FF+40HA+3NEW TH-E+GASTET =HL : 1

TRAP

SOURCE:CRS R(=NO): 1  
FREQ(MHZ): (=NO): 7551

# MEAS PTS(=NO): 30  
# PTS IN FIT(=NO): 11

N (Q) SET# 2 (=NO): 8 97 ← A CHANGE TO CHANGE N & REDD A MEASUREMENT  
SKY OFFSET(DEG)(=NO): 2 ? ←DECLINATION OFFSET FROM STAR CENTER FOR SKY CUT

CLOUDS(0 TO 9=RAIN)(=NO): 0  
WIND (MPH)(=NO): 0

(77 1027 11.25)  
NBS10.05 MEAS (D1-F14) T3-F12: X.06 (D1-4) T2-4

-7-

Sysm # 3.04

RUN 2

PROG 276.5411 CAMP ROBERTS: ANT#1  
TUE: 1977 MAY 10 (1976.470)  
7.551 GHz: 60.0 Ft DISH

G/Ta 41.34 dB/K G/T 43.30 dB/K

TEMP 85.8 F DEW PT. 45.8 F REL HUMID 25.0 % WATER DENS 7.6 gm/m3 CLOUD COVER 3 WIND 3 mph

MEAS	HPBW	TIME(HRS)	OFFSET	AZIMUTH	ELEV	CUT	RUN	SET	N
6sec	0.1371	11.45139	2.000deg	29.62	60.01	-3	2	2	7

$T/T_0 = 0.6363 + 0.00115 \times 100 L$

TIME USED TO SET THE ANTENNA  
GO:1=NEW AZ-EL (=NO): 0

CLAPS	PEAK#	PTS EX	TIME	TIME	TIME	TIME
27sec	14	-1	0.0000deg	0.0000deg	0.0000deg	0.0000deg

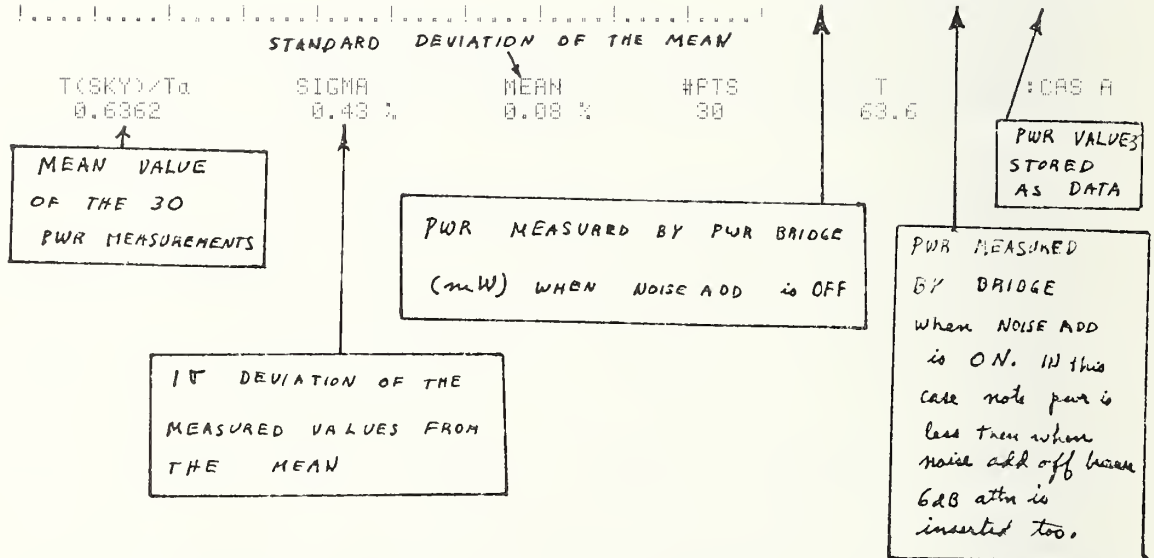
(TIME ALLOWED TO SET ANTENNA ON BREAK POINT SWITCHES USED) 6 sec

BAG FWP	BAG FFW+α	FWR+α/STD	STD	Ta#	MANL	PRGN	STD CK	FLTR
0.5070mW	0.3820mW	1	4.0800	0	4dB	3dB	0.0160dB	4

ZERO LEVEL	100% LEVEL	X(K)	K	Y(DB)	T(CRS)	SKUN	T	Ta
0.5375*Ta	0.9530*Ta	2.33E-05	0.975	1.746	31.5	563	63.8	100.0

# MEAS (cont)

N3	-10	-6	-2	2	6	10	(%)	PWR#1	PWR#2	P-Pa
1								0.6053	0.3882	0.6379
2			+	!				0.6055	0.3819	0.6337
3				!	+			0.6069	0.3807	0.6394
4			+	!				0.6053	0.3814	0.6356
5			+	!				0.6064	0.3813	0.6367
6				!	+			0.6074	0.3812	0.6387
7				+	!			0.6067	0.3815	0.6367
8				!	+			0.6066	0.3801	0.6406
-9				!	#			0.6065	0.3802	0.6399
-10				#				0.6063	0.3810	0.6375
-11			#	!				0.6057	0.3819	0.6340
-12			#	!				0.6051	0.3818	0.6331
-13				#				0.6064	0.3812	0.6372
14			+	!				0.6054	0.3812	0.6355
-15			#	!				0.6053	0.3817	0.6339
-16				!	#			0.6066	0.3809	0.6383
-17			#	!				0.6059	0.3821	0.6338
-18				#				0.6059	0.3808	0.6373
-19				#				0.6062	0.3820	0.6347
20			+	!				0.6052	0.3820	0.6329
21			+	!				0.6049	0.3814	0.6341
22				!	+			0.6054	0.3801	0.6384
23				!	+			0.6062	0.3809	0.6375
24			+	!				0.6051	0.3816	0.6338
25			+	!				0.6056	0.3821	0.6333
26			+	!				0.6054	0.3835	0.6290
27				!	+			0.6054	0.3862	0.6381
28				!	+			0.6063	0.3808	0.6381
29			+	!				0.6050	0.3814	0.6342
30				!	+			0.6057	0.3794	0.6409



## MEAS (cont)

```

N (C) SET# 2      )( =NC): 8      2

```

1977 OCT 27 11 hrs 29 min GMT time

NBS10.05 MEAS (D1-F14) T3-F12: 3.06 D1-4) T3-4

ETMS SYSTEM SERIAL #

— 5 —

System # 3.04

RUN 2

PROG 276.5411 CAMP ROBERTS, ANT#1  
TUE: 1977 MAY 10 ( 1976.470)  
7.551 GHz; 60.0 Ft PISH

G/Ta	G/T
41.34 dB/K	43.31 dB/K

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
88.8 F	45.8 F	22.7 %	7.5 gm/m3	3	3 mph

## BIASED PREDICTION OF DESIRED ANT COORDINATES

MEAS	HPBW	TIME(HRS)	OFFSET	ALIMUTH	ELEV	OUT	RUN	SET	N
6sec	0.1371	11.52026	-0.069deg	32.39	61.56	-2	2	2	8

$$T/T_0 = 0.6349 + 0.60115 \cdot \cos L$$

```
GO : 1=NEW AZ,EL : =NC): 0
```

X SPACE BAR, EXCLUDE  
WHEN ANTENNA SET

## BIASES USED IN PREDICTION

ELAPSE	PEAK#	PTS EX	HR BIAS	DCL BIAS	AZ BIAS	EL BIAS
14sec	16	1	0.0000deg	0.0000deg	0.0000deg	0.0000deg

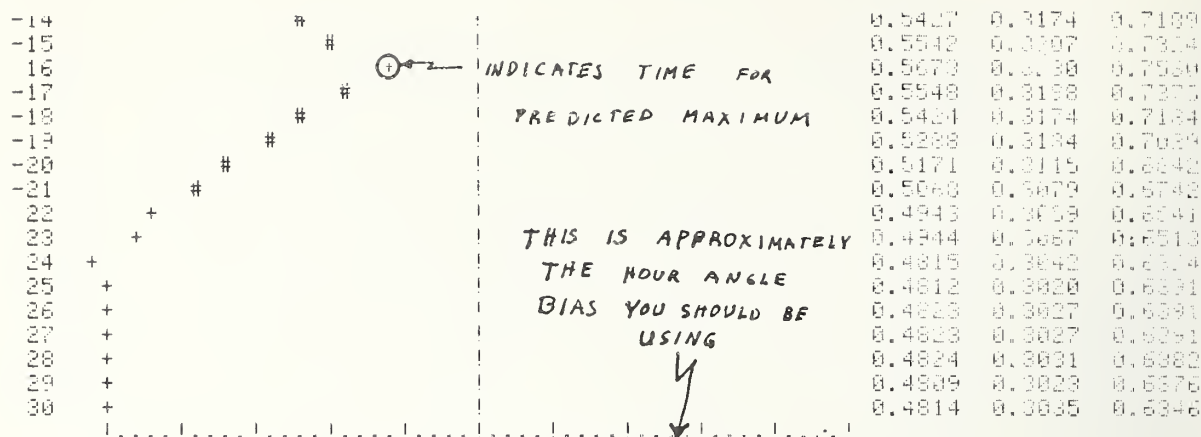
ZERO LEVEL	100% LEVEL	W(K)	K	Y(DB)	T(CAS)	S(JUN)	T	T <sub>0</sub>
0.6362*T <sub>0</sub>	0.9518*T <sub>0</sub>	2.32E-05	0.876	1.750	31.6	582	63.6	100.0

	0	20	40	60	80	100 (%)	PWR#1	PWR#2	P/Po
N3	!	!	!	!	!	!			
1	+						0.6076	0.3834	0.6412
2	+						0.6048	0.3862	0.6372
3	+						0.6051	0.3810	0.6353
4	+						0.6050	0.3813	0.6345
5	+						0.6059	0.3798	0.6401
6	+						0.6048	0.3816	0.6322
7	+						0.6055	0.3800	0.6355
8	+						0.6216	0.3883	0.6432
9	+						0.6328	0.3851	0.6516
10	+						0.6361	0.3873	0.6513
-11		+					0.6514	0.3512	0.6788
-12			+				0.6515	0.3327	0.6529
-13				+			0.6510	0.3948	0.7000

# signs INDICATE which points used in the parabolic fit.



# MEAS (cont)



#FIT 11 ANT HPBW 0.120 deg T(CAS R)/T<sub>0</sub> 0.7337+- 1.51% HR ANG OFFSET 0.0015 deg PEAK# 15.89 LEVEL: 30.9% CHS R

TOTAL hr angle offset between  
Fit peak # and unbiased predicted #

increase HR BIAS if peak before PEAK#  
decrease DECL BIAS if 1st cut too deep

N (@ SET# 2) (C=ND): 9 9

(77 1027 11.33)

HBS10.05 MEAS (D1-F14) T3-F12: 5.06 D1-4) T3-4

Sysm # 3.04

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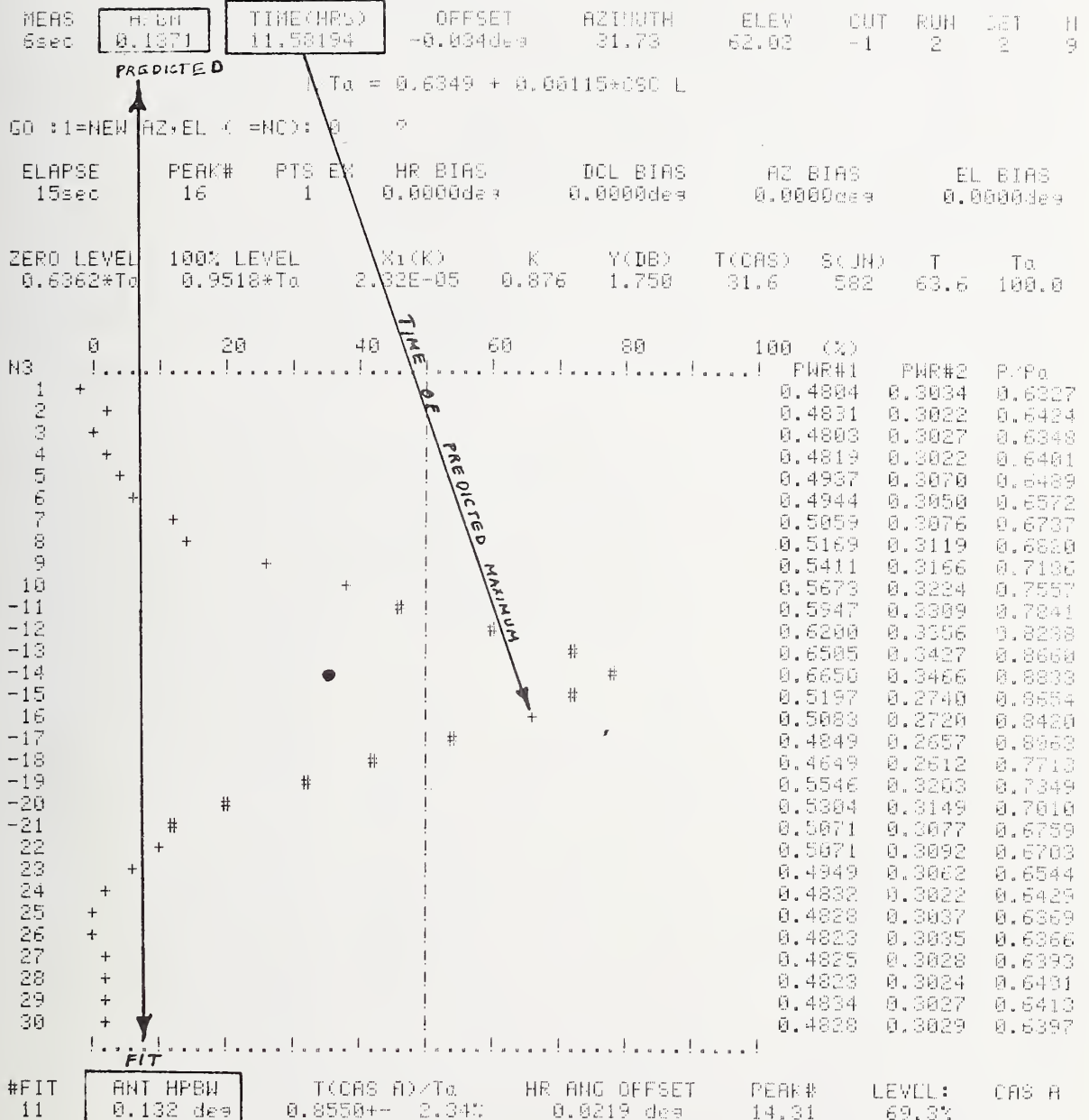
RUN 2

# MEAS (cont)

PRG 276.5411 CHMP ROBERTS, ANT#1  
TUE: 1977 MAY 10 : 1976.470  
7.551 GHz, 60.0 Ft DISH

G-Ta 41.34 dB/K G-T 43.31 dB/K

TEMP 88.9 F DEW PT. 45.8 F REL HUMID 22.7 % WATER DENS 7.5 gm/m3 CLOUD COVER 3 WIND 3 mph



increase HR BIAS if peak before PEAK#  
decrease DECL BIAS if 1st cut too deep

# MEAS (cont)

10-

Sysn # 3.04

RUN 2

PROG 276.111 CAMP MUEBERT, HN1#1  
TUE: 1977 MAY 10 19:56.470  
7.551 GHz, 60.0 ft Dish

G To G.T  
41.34 dB/K 43.31 dB/K

TEMP 89.0 F DEW PT. 45.8 F REL HUMID 22.6 % WATER DENS 7.5 g/m<sup>3</sup> CLOUD COVER 0 WIND 0

PREDICTED CENTER CUT

MEAS HPBW TIME(HRS) OFFSET AZIMUTH ELEV CUT RUN SET H  
6sec 0.1371 11.64259 0.000deg 31.05 62.38 0 2 2 10

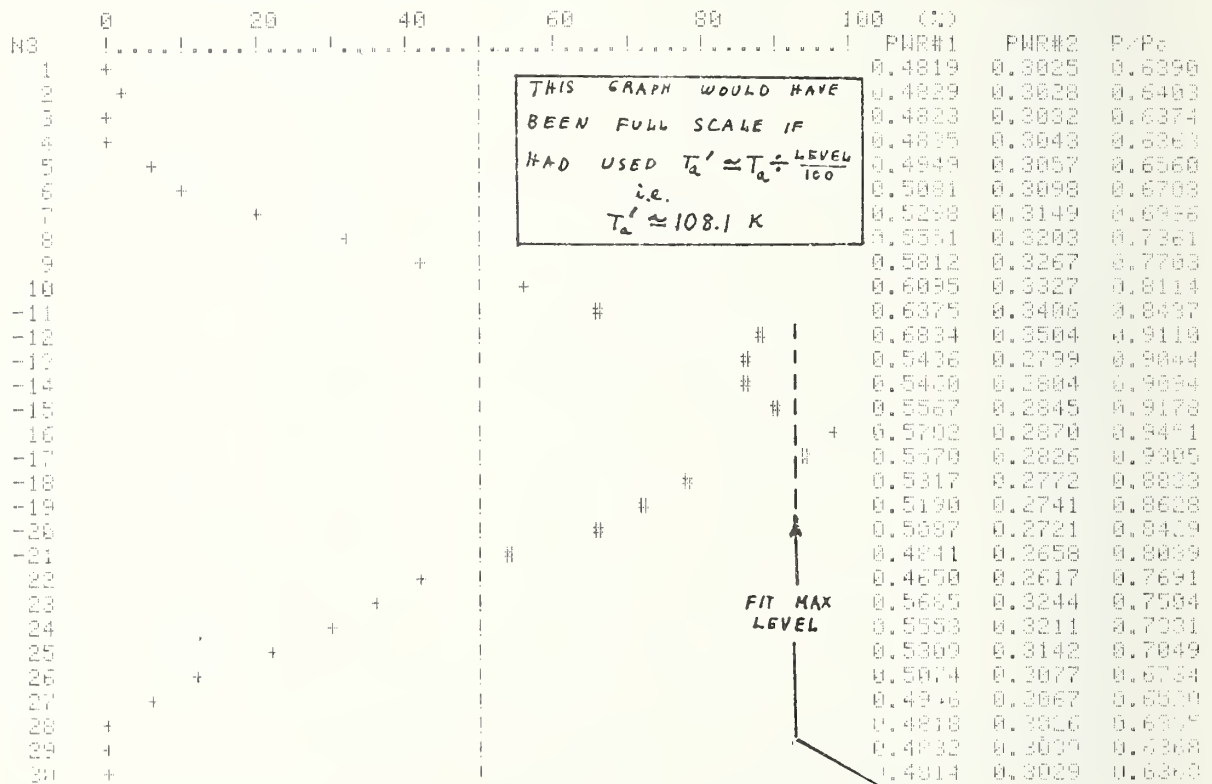
$$T/T_0 = 0.6349 + 0.00115 * \text{CSC } L$$

GO :1=NEW AZ,EL ( =NO): 0

ELHPSE 14sec PEAK# 16 PTS EX 1 HR BIAS 0.0000deg DCL BIAS 0.0000deg AZ BIAS 0.0000deg EL BIAS 0.0000deg

ZERO LEVEL 100% LEVEL X(K) K  
0.6362\* $T_0$  0.9518\* $T_0$  2.32E-05 0.876

CENTER CUT PREDICTION ADJUSTS GRAPH SCALE



#FIT ANT HPBW T/CAS H\* $T_0$  HR BIAS OFFSET PLZ(K) LEVEL CAS A  
11 0.165 deg 0.9283+- 1.615 0.0000deg 19.13 90

— 100 —

1211

The figure illustrates the experimental design with two parallel paths. The left path starts with a 'Pretest' phase, which includes 'Pretest questions' and 'Pretest answers', leading into the 'Main test' phase. The right path starts with a 'Posttest' phase, which includes 'Posttest questions' and 'Posttest answers', also leading into the 'Main test' phase. The 'Main test' is the central component in both setups.

[illegible]

USES RESULTS OF LAST

# SKY PROFILE MEASUREMENT

UNLESS ENTER NEW VALUE ~~IN~~ KEY 8

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# MEAS (cont)

PROG 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAR 14 ( 1976.478 )  
 7.551 GHz, 60.0 Fr DISH

G/Ta 41.34 dB/K G/T 43.31 dB/K

TEMP 89.0 F DEW PT. 45.8 F REL HUMID 22.6 % WATER DENS 7.5 g/cm<sup>3</sup> CLOUD COVER 3 WIND 3 mph

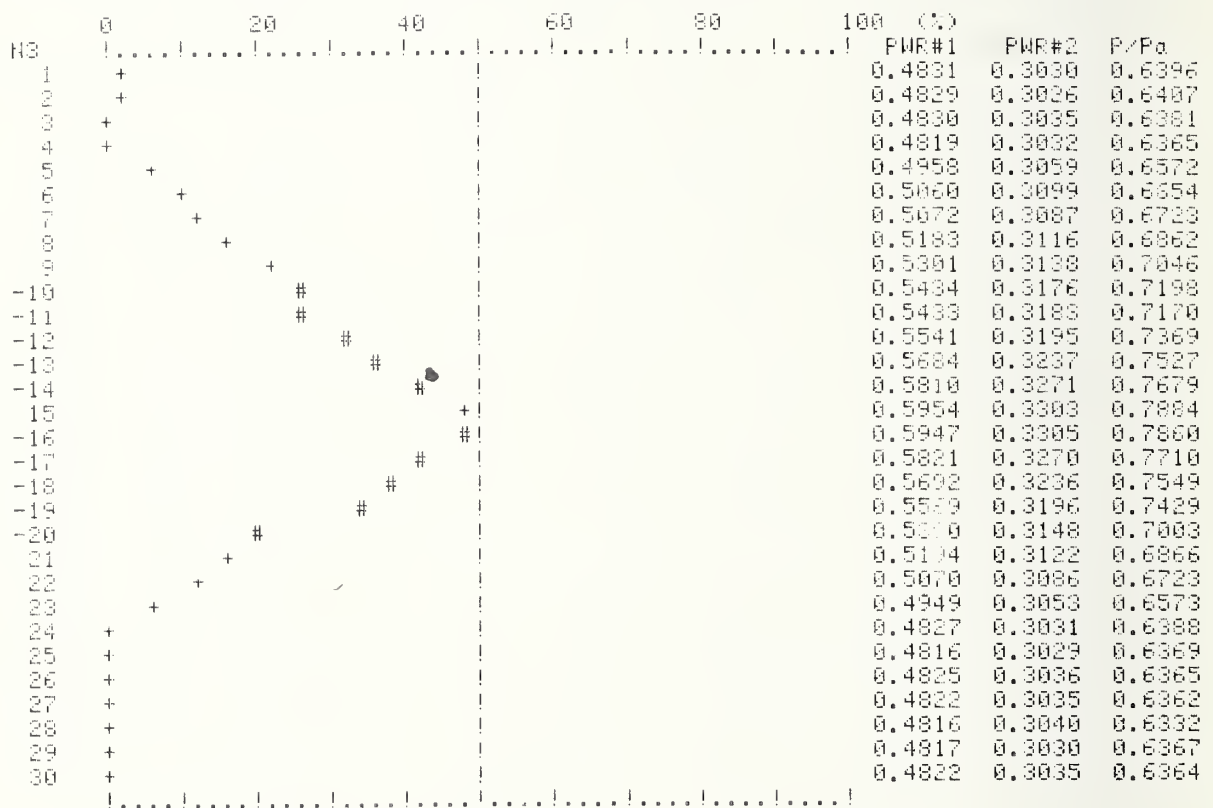
=====  
 MEAS HPBW TIME(CHRS) OFFSET AZIMUTH ELEV CUT RUN SET N  
 6sec 0.1371 11.76139 0.069deg 29.64 63.05 2 2 2 12

T/Ta = 0.6349 + 0.00115\*OSC L

GO :1=NEW AZ\*EL ( =NO ): 0 ?

ELAPSE PEAK# PTS EX HR BIAS DCL BIAS AZ BIAS EL BIAS  
 15sec 15 0 0.0000deg 0.0000deg 0.0000deg 0.0000deg

ZERO LEVEL 100% LEVEL Xi(K) K Y(DB) T(CAS) S(JN) T Ta  
 0.6362\*Ta 0.9519\*Ta 2.32E-05 0.876 1.750 31.6 582 63.6 100.0



#FIT ANT HPBW T(CAS A)/Ta HR ANG OFFSET PEAK# LEVEL: CAS A  
 11 0.135 deg 0.7775+- 1.47% -0.0004 deg 15.18 44.8%

increase HR BIAS if peak before PEAK#  
 decrease DECL BIAS if 1st cut too deep



## MEAS (cont)

NBS10.05 MERS (D1-F14) T3-F12: 77.1027 11.47 K.06 (D1-4) T2-4

Sym # 3.04

-13-

RUN 2

```

PROG 276.5411 CAMP ROBERTS; ANT#1
TUE: 1977 MAY 10 ( 1976.470)
7.551 GHz; 60.0 Ft DISH

```

G/T <sub>a</sub>	G/T
41.34 dB/K	43.31 dB/K

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
89.0 F	45.8 F	22.6 %	7.5 gm/m3	3	3 mph

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

BEST FIT FOR THE 5 CUTS       $T_0 = 100$  K

#FIT	ANT HPRW	TCCAS AD-Ta	DECL OFFSET	T-Ta	ELEV	RUN	SET
5	10.263 deg	0.9162+- 1.14%	0.005 deg	0.6362K	62.48deg	2	2

G	G/T	NEF	HUF
60.82 dB	42.78 $\pm$ 0.18 dB	0.404 K/MHz	0.406 K/MHz

```
100*(DATA-FIT)/(MAX DT(CAS A)/T0)
```

OUT	-2	-1	0	1	2
	1.0%	-3.6%	4.6%	-2.5%	0.5%

TO REPLACE A CUT: (1) KEY 1 then (2) KEY 1 up

REMARKS:??THIS IS A SIMULATION OF CAS A !!

STORE: INT FILE 16 EXT FILE 11 EXT SET# 3

RUN SET		DIP BJFD	CODE	T/Ta P/Pa G/T	CSC PWR G/Ta	TIME dPodJ HPBW#1	TEMP C/KT HPBW#2	WATER E+C/Ta DECL	#PTS CNT/Ta NEF	Padd NUF	
2.01	CAS A	-0.0		0.556	0.001	10.313	90.900	7.551	7.548	4.000	0.000
3.02	CAS A	62.4		42.784	40.820	0.165	10.263	7.551	0.006	0.404	0.406

FOR N3=1  
LOG(P/U)\*10^4  
→ -0.4 ←

ELEMENTS OF THE STORED DATA MATRIX  $D$

# MEAS (cont)

## EIRP, C/M T ROUTINE

\* KEY 0

```

1SKY,2C/T,3EIRP,4LINK,5NEW TAPE,6RSTRT,7=NO): 2
SLANT RANGE,1073+Kw( =NO): 40.349 ?
ROR GAIN SLOPE/MHz( =NO): 0 ?
AZ(BEG)( =NO): 29.40555692 ?
EL(DEG)( =NO): 15 ?
NOISE ADD:0=#1,2,1=#1,2=#2( =NO): 0 ?0
BIRD: SET#( =NO): 4 ?0
CLOUDS(0 TO 9=RAIN)( =NO): 0 ?0
WIND (MPH)( =NO): 0 ?12
CODE:0=SKY,1=-F, 2=ROR @ F, 3=+F,4=OTHER( =NO): 0.068545333 ?0
INSERT SDB WHEN T(ADD)( =NO): 1 ?1
FREQ(MHZ)( =NO): 7551 ?

```

```

FLTR:1=2030,2=1070,3=2070,4=5070( =NO): 4 ?4
MANL ATN(dB)( =NO): 4 ?
# MEAS PTS( =NO): 30 ?5

```

```

= (77 1027 12.10)
HB910.05 MEAS <D1-F14> T3-F12: X.06 <D1-4> T2-4

```

-14-

Sysm # 3.04

RUN 2

```

PROG 276.5411 CAMP ROBERTS, ANT#1
TUE: 1977 MAY 10 ( 1976.470)
7.551 GHz, 60.0 Ft DISH

```

```

G/Ta G/T
41.34 dB/K 43.29 dB/K

```

```

TEMP DEW PT. REL HUMD WATER DENS CLOUD COVER WIND
85.9 F 45.8 F 25.0 % 7.6 gm/m3 3 12 mph

```

```

=====
BRG PWR BRG PWR+d PWR+d/STD? STD Td# MANL PRGM STD CK FLTR
0.4930mW 0.3850mW 1 4.0800 0 4dB 4dB -0.0160dB 4

```

CODE:0=SKY,1=-F, 2=ROR @ F, 3=+F,4=OTHER

```

SLANT RANGE AZIMUTH ELEV ROR F BRDWD CODE RUN SET
4.035E+07Kw 29.41 15.00 7.5510 5.5 KZ 0 2 3

```

```

FILTER# NOISE PW 1st CONST 2nd CONST GAIN SLOPE EDIR PW
4 5.734 MHz -0.1400 MHz 0.0000 Hz/Hz 0.0000/MHz 5.734 mW

```

# MEAS (cont)

H3	P-P(ADD)	PWR#1	PWR#2	MANUAL	PRG	TIME (HRS)
1	0.63731	3.04	7.80	4 dB	4 dB	12.19167
2	0.63532	3.04	7.83	4 dB	4 dB	12.19361
3	0.63897	3.04	7.81	4 dB	4 dB	12.19580
4	0.64180	3.04	7.78	4 dB	4 dB	12.19778
5	0.64248	3.04	7.77	4 dB	4 dB	12.19944

#P15 P-P(ADD) PWR#1 (dB) (PWR#2-PWR#1) (dB)  
 5 0.63910 +- 0.5 % 3.04053 +- 0.1 % 4.75764 +- 0.5 %



# MEAS (cont)

(77 1027 12.12)

HBS10.05 MEAS D1-F14 T3-F12: 3.06 D1 4 12-4

-15-

Sysm # 3.04

TIME

PROG 276.5411 CAMP ROBERTS, ANT#1  
TUE: 1977 MAY 10 (1976.470)  
7.551 GHz, 60.0 Ft D1SH

G1a G1T  
41.34 dB K 41.34 dB K

TEMP 85.9 F DEN PT. 45.8 F REL HUMID 25.0 % WATER DENS 7.6 g/cm<sup>3</sup> CLOUD COVER 5 WIND 12 mph

0.946:K8 0.996:K9 0.00dP(odd) 40.35\*10<sup>16</sup>:SR 5.734:BW

SPACE LOSS 202.12 dB T/Ta 0.6391 ONT/Ta 0.0000 ONT/SNT 0.0000 rev EIRP\*G/Ta 0.00 dBW C/KT 0.00 dB RUN 2

REMARKS: ?SIMULATION OF COLD SKY, OFF SATELLITE

STORE: INT FILE 18

EXT FILE 12

EXT SET# 4

MAT ID:	1	2	3	4	5	6	7	8	9	10
(A <sub>E</sub> -180)*100	EL*100	1000* LGT (PWR with noise add off at BRD6)								
-15059	1500	-3174	-3171	-3168	-3170	-3170		0	0	0
0	0	1000* LGT (BRD6 PWR noise add on)								
C2:1= STD ATTN when noise add	MANE	924	935	925	909	907		0	0	0
0	0	1000* LGT (P/P <sub>n</sub> )								
# MEAS	BW*10	-1956	-1970	-1948	-1926	-1921		0	0	0
0	0	1000 * TIME (ms)								
LGT (P/P <sub>n</sub> ) 10 <sup>14</sup>		12192	12194	12196	12198	12199		0	0	0
0	0	GAIN SLOPE								
LGT (PWR1) *10 <sup>14</sup>		0	0	0	0	0		0	0	0
483		TOTAL ATTN (E2+E6)								
0		8	8	8	8	8		0	0	0
LGT (PWR1 - PWR2) *10 <sup>14</sup>										
677										
0										
		↑	↑	↑	↑	↑				
		1 <sup>st</sup> MEAS	2 <sup>nd</sup> MEAS	3 <sup>rd</sup> MEAS	4 <sup>th</sup> MEAS	5 <sup>th</sup> MEAS				



# MEAS (cont)

```

RESET MEAS(1=YES)(=NO): 0      ?
BIRD: 581#(=NO): 4      ?
CLOUDS(0 TO 9=RAIN)(=NO): 0      ?2
WIND (MPH)(=NO): 0      ?10
CODE:0=SKY,1=-F, 2=ROR @ F, 3=+F,4=OTHER(=NO): 0      ?1
INSERT 56B WHEN (CADD)(=NO): 1      ?
FREQ(MHZ)(=NO): 7551      ?7540

```

```

FLTR:1=2000,2=1070,3=2070,4=5070(=NL): 4      ?
NAHL ATNGBD(=NO): 4      ?
# MEAS PTS(=NO): 5      ?

```

```

(77 1027 12.14)
NBS10.05 MEAS (D1-F14) T3-F12: X.06 (D1-4) T2-4

```

-16-

Sysn # 3.04

RUN 2

```

PROG 276.5411 CAMP ROBERTS, ANT#1
TUE: 1977 MAY 10 (1976.470)
7.540 GHz, 60.0 Ft DISH

```

```

G/Ta G/T
41.33 dB/K 43.28 dB/K

```

```

TEMP DEW PT. REL HUMD WATER DENS CLOUD COVER WIND
88.6 F 45.8 F 22.9 % 7.5 gm/m3 2 10 mph

```

```

BRG PWR BRG PWR+a PWR+a/STD? STD Ta# NAHL PRGM STD CK FLTR
0.5290mW 0.3143mW 1 4.0800 0 4dB 4dB 0.0240dB 4

```

CODE:0=SKY 1=-F, 2=ROR @ F, 3=+F,4=OTHER

```

SLANT RANGE AZIMUTH ELEV ROR F BNDWD CODE RUN SET
4.035E+07Km 2.00 15.00 7.5400 5.7 MZ 1 2 4

```

```

FILTER# NOISE BW 1st CONST 2nd CONST GAIN SLOPE EOIY BW
4 5.734 MHz -0.1400 MHz 0.0000 MHz*12 0.0000/MHz 5.734 MHz

```

NS	P/P(ADD)	PWR#1	PWR#2	MANUAL	PRGM	TIME(HRS)
1	0.69756	3.34	8.12	4 dB	4 dB	12.25667
2	0.70232	3.34	8.10	4 dB	4 dB	12.25833
3	0.70332	3.34	8.10	4 dB	4 dB	12.26000
4	0.69762	3.34	8.12	4 dB	4 dB	12.26167
5	0.69620	3.34	8.13	4 dB	4 dB	12.26333

```

#PTS P/P(ADD) PWR(1dB) CIPR(1) PWR#1(1dB)
5 0.69940 +- 0.5 % 3.3300 +- 0.1 % 4.77530 +- 0.4 %

```

## MEAS (cont)

77 1917 16.15

FB310.05 FB96 (D1-F14 T1-F12: .06 D1-4 T1-4

1000

 $2.50 \pm 3.24$ 

```

PROG 276.5411      CAMP RECEPTE, ANT#1
TUE: 1977 MAY 10   @ 1976.470
7.540 GHz: 60.6 F1 DISH

```

G. To		G. T	
44-38862-1	44-38862-2	44-38862-3	44-38862-4

TEMP	DEW PT.	REL HUMID	WATER DEN	CLOUD COVER	WIND
83.6 F	45.8 F	22.9 %	7.5 gm / m3	2	10 mph

8.940:K9      8.996:K9      3.34dP(aad)      40.35\*1016:SR      5.734:BW

SPACE LOSS	T/Ta	ONT/Ta	ONT/SNT	rev EIRP-G/Ta	C/Nt	PUN	SET
231.11 dB	0.5894	0.6994	1.00+4	0.00 dBW	0.00 dB	2	4

REMARKS: STIMULATION OF ON SATELLITE BUT BELOW THE CARRIER FREQ

STORE: INT FILE 20 ENT FILE 10 ENT SET# 5

# MEAS (cont)

```

FEED: REF 1=FLS 1=NO: 0
BIP1: SEI# 1=NO: 5
CLOUD: 10 1=PHILIP 1=NO: 0
WIND: REF 1=NO: 0
CODE: 0=SKY, 1=-F, 2=ROR @ F, 3=+F, 4=OTHER 1=NO: 1 22
INSERT: 508 WHEN T=ADD 1=NO: 1 20
FREQ: 276.5411 1=NO: 2549 07051
FLTR: 1=2000, 2=1000, 3=2000, 4=5000 1=NO: 4 0
MANL: 000000 1=NO: 4 06
# MEAS: P12 1=NO: 5 0

```

(77 1027 12.18)  
 HB510.05 MEAS: 01-F14 T3-F12: 3.06 (01-4) T2-4

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Scan # 3.04

RUN 2

PRG: 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAY 10 (1976.470)  
 7.551 GHz, 60.0 F, DISH

G/Ta G/T  
 41.34 dB/K 43.29 dB/K

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
68.6 F	45.8 F	22.9 %	7.5 gm/m3	0	1 mph

PRG PWR	PRG PWR+0	PWR+0/STD	STD	Tot	MANL	PRGM	STD CK	FLTR
0.3140mW	0.5564mW	0	4.0000	0	6dB	7dB	-0.0030dB	4

CODE: 0=SKY, 1=-F, 2=ROR @ F, 3=+F, 4=OTHER

SLANT RANGE	AZIMUTH	ELEV	ROR F	BNDWD	CODE	RUN	SET
4.835E+07km	2.00	15.00	7.5510	5.7 MC	2	2	5

FILTER#	NOISE BW	1st CONST	2nd CONST	GAIN SLOPE	EQUIV BW
4	5.734 MHz	-0.1400 MHz	0.0000 MHz12	0.0000/MHz	5.734 MHz

Hz	P/P(ADD)	PWR#1	PWR#2	MANUAL	PRGM	TIME(HRS)
1	1.28660	6.27	11.15	6 dB	7 dB	12.31944
2	1.29363	6.27	11.12	6 dB	7 dB	12.32111
3	1.20055	6.27	11.14	6 dB	7 dB	12.32278
4	1.20604	6.26	11.14	6 dB	7 dB	12.32444
5	1.20431	6.27	11.11	6 dB	7 dB	12.32611

Hz	P/P(ADD)	PWR#1 (mW)	(PWR#2-PWR#1) (mW)	CODE
5	1.20922 +- 0.3 %	6.26943 +- 0.1 %	4.86298 +- 0.3 %	2

1995-1996

- 3 -

EQU. 4

G <sub>T</sub>	G <sub>T</sub>
41.34 dB/K	43.29 dB

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

SPACE LOSS	T/Ta	DNT/Ta	DNT/SNT	nc, EIRP+G/Ta	C/N1	RUN	SET
202.12 dB	0.6891	0.6994	1.0944	39.35 dBW	67.02 dB	2	5

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FEMERS: SIMULATED COMPLETE MEASURE, BUT ONLY MEAS ONLY ON ONE SIDE

510000 121 FILE 22

EXT FILE 14

EXT SET# 6

# MEAS (cont)

```

RESET MEAS(1=YES)(=NO): 0      ?
EIRP: SET#(=HL): 7      96
CLOUDS(0 TO 9=RAIN)(=NO): 0      ?
WIND (MPH)(=NO): 0      ?
CODE:0=SKY,1=-F, 2=ROR @ F, 3=+F,4=OTHER(=NO): 2      93
INSERT SDB WHEN T(ADD)(=NO): 0      ?1
FREQ(MHZ)(=NO): 7551      97561
FLTR:1=2030,2=1070,3=2070,4=5070(=HL): 4      0
MANL ATN(dB)(=NO): 6      04
# MEAS PTS(=NO): 5      ?

```

(77 1027 12.25)

NBS10.05 MEAS <D1-F14> T3-F12: 3.06 <D1-4 T2-4

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Sys# # 3.04

RUN 2

PROG 276.5411 CAMP ROBERTS, ANT#1  
 TUE: 1977 MAY 10 ( 1976.470)  
 7.561 GHz, 60.0 Ft DISH

G/Ta G/T  
 41.35 dB/K 43.30 dB/K

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
83.6 F	45.8 F	26.9 %	7.6 gm/m3	0	0 mph

BRG FWR	BRG PRW+a	PWR+a/STD	STD	To#	MANL	PRGM	STD CK	FLTR
0.5840mW	0.3286mW	1	4.0860	0	4dB	4dB	0.0130dB	4

CODE:0=SKY,1=-F, 2=ROR @ F, 3=+F,4=OTHER

SLANT RANGE	AZIMUTH	ELEV	ROR F	BNDWD	<span style="border: 1px solid black;">C...</span>	RUN	SET
4.035E+07Km	2.00	15.00	7.5610	5.7 MZ	<span style="border: 1px solid black;">5</span>	2	6

FILTER#	NOISE BW	1st CONST	2nd CONST	GAIN SLOPE	EQIV BW
4	5.734 MHz	-0.1400 MHz	0.0000 MHz±2	0.0000 dBz	5.734 MHz

H3	P/P(ADD)	PWR#1	PWR#2	MANUAL	PROG	TIME(CHR)
1	0.76847	3.68	8.47	4 dB	4 dB	12.43639
2	0.76878	3.68	8.46	4 dB	4 dB	12.43861
3	0.77030	3.68	8.45	4 dB	4 dB	12.44000
4	0.76936	3.68	8.46	4 dB	4 dB	12.44194
5	0.77110	3.69	8.47	4 dB	4 dB	12.44333

#PTS	P/P(ADD)	PWR#1(mW)	PWR#2(mW)	(PWR#1-PWR#2)/PWR#1	ATN
5	0.76968 ±- 0.1 %	3.68936 ±- 0.1 %	4.70216 ±- 0.1 %		<span style="border: 1px solid black;">3</span>



## MEAS (cont)

NBS10.05 NERS :D1-F14 T3-F12: 0.06 :D1-4 12-4

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SVEN # 3.04

```

PROG 276.5411 CAMP ROBERTS, ANT#1
TUE: 1977 MAY 16 (1976.473)
7.561 GHz; 60.0 F+ DISH

```

G/T <sub>0</sub>	G/T
41.35 dB/K	43.30 dB/K

TEMP	DEW PT.	REL HUMD	WATER DEHS	CLOUD COVER	WIND
83.6 F	45.9 F	26.9 %	7.6 gm/m3	0	0 mph

12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045

0.946:K8      0.996:K9      3.51dP(odd)      40.35\*10<sup>6</sup>:SR      5.734:BW

SPACE LOSS	T/Ta	ONT/Ta	ONT/SNT	rho EIRP+G/Ta	C/KT	RUN	SET
202.14 dB	0.6391	0.7345	1.1493	39.00 dBW	66.54 dB	2	6

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041

REMARKS: 2USES 2nd ONT; RECALCULATES CMT USING AVERAGE OF THE TWO ONT VALUES

STORE: INT FILE 24 EXT FILE 15 EXT SET# 7

[illegible]

## 6.5 The REWORK Program

The purpose of the program REWORK is to fit the data sets collected with the MEAS program and curve fit it to a two-dimensional gaussian curve and calculate six primary parameters  $G/T$ ,  $G/T_a$ , NEF, NUF, the half power beam width of emission Cas A convoluted with the antenna beam pattern along a path of constant declination (HPBW#1), the half power beam width perpendicular to constant declination (HPBW#2), each as a function of elevation. Then the program calculates least squares fit for each of the six primary parameters to curves of the form  $y = ax + b$  where  $x$  is either the elevation angle (linear fit) or the cosecant of the elevation angle (csc fit). For the parameters  $G/T$ ,  $G/T_a$ , NEF, and NUF the measurement errors are calculated. The measurement errors taken into account are those discussed in the site preparation section, and by Daywitt [3] in a separate publication. The deviations of the data points from the fit curves are calculated for the six primary parameters, and also for the measured Y-factor. The conditions assumed for measurement, and for the error estimate, are labeled and printed out. The results of many of the subcalculations used in the error calculations and some related parameters are printed out. The peripheral calculations are presented to help the metrologist using the REWORK program get a better feel about the conditions of the measurement and information to help decide on whether to retain or reject a measurement set.

### 6.5.1 General Information

Basically, the REWORK program reworks the measurement data at one of three rework levels and prints out the results. A full first level rework is activated by using an integer rework number entered into the rework data statements located at the end of the REWORK program and selecting option " $\emptyset$ =REWORK" at "the restart alternatives position"(TRAP) reached, e.g., via Key  $\emptyset$ . The first level rework fits the data to a two-dimensional gaussian, uses the fit data to calculate  $G/T$ ,  $G/T_a$ , NEF, NUF, HPBW#1, HPBW#2, etc., for each data set (typically 180 data points), and then least squares fits the results to a linear and to a cosecant function of the antenna elevation angle.

A partial second level rework is activated by using a noninteger rework number in the rework data statements and selecting option " $\emptyset$ =REWORK" at TRAP. The second level rework uses the last stored fit data information and/or new

site or error data (e.g. site elevation, HPBW#1, ambient temperature, . . .) to recalculate  $G/T$ ,  $G/T_a$ , . . ., and refits the results to a linear and to a cosecant function of the antenna elevation angle.

The third level rework option is activated from "2 = AUTO" in conjunction with "3 = DEL" option at TRAP (e.g. Key Ø). For this option  $G/T$ ,  $G/T_a$ , NEF, and NUF are not recalculated for the individual sets, but the least squares fits of the various parameters versus elevation are refit and the measurement errors recalculated. Primarily this rework option is for deleting data sets and recalculating the least squares fits.

The refit programs are interactive, and typically the data are reworked four times--first level rework for all frequencies, first level rework for a specific frequency, second level rework for a specific frequency, and finally deletion of bad data sets plus a third level rework for a specific frequency.

#### 6.5.2 Entry into the REWORK Program

The REWORK program can be accessed via links to the REWORK program (REWORK) available from "the restart alternatives position" (TRAP) in either the SITE PREP or the MEAS programs, or by inserting the REWORK tape into the internal cassette and (1) Load, execute (2) Run, execute, (3) appropriate response to computer-generated instructions until REWORK is loaded. When REWORK is loaded the program stops at TRAP with the display "Ø REWORK, 1LOAD, 2AUTO, 3DEL, . . . ." If the rework data statements have not been altered, then the program needs to be halted by pressing the END Key (a lazy T appears in the display) and fetching the data statements (FETCH 6000, EXC) and using the editing keys to enter the appropriate changes. We recommend that the REWORK remark statement and REWORK data statements be listed (LIST 6000, EXC) and taped to the cover of the notebook which is used to collect the REWORK results.

#### 6.5.3 Data Tapes and Data Statements for a Level One Rework

The REWORK program is designed to rework the data contained on a single summary tape, so if data from different tapes are desired in the rework, the data have to be collected onto a single tape. On any single summary tape, files exist to store results for two different reworks. If the results of more than two reworks are needed for a data set, a duplicate summary tape per two additional results is needed. The full rework is accomplished by providing an

integer rework number in the data statements at the end of the computer program and selecting the "ØREWORK" at TRAP.

Rules for the rework data statement are as follows. For convenience, the identification of entries in the data rework statements is in a remark statement immediately preceding the rework data. The rework data statement has eight entries. First is the rework number. For a complete rework this number is an integer. To avoid confusion, we recommend this number be unique for each rework associated with a particular measurement site. The computer program requires that the rework number in successive rework data statements be larger than each preceding number. This allows starting at a particular rework statement and stepping over previous reworks.

The second rework entry is the file set (1 or 2). This entry determines the locations where the results of the rework are stored on the summary tape.

The third rework entry is the measurement frequency (expressed in gigahertz) of the data sets included in the rework. The frequency recorded with a data set on the summary tape must agree exactly with this rework entry or else it is not included in this rework. If the frequency was incorrectly entered at the time the data was recorded, it has to be corrected to be included with a rework. An exception to this rule is for an all-frequency rework. To rework all data sets regardless of frequency, a Ø is entered for the frequency entry.

The fourth and fifth entries in the data rework statement are the zenith value and the cosecant coefficient of  $T/T_a$  (ratio of system temperatures to noise add temperature). This is information obtained from the sky profile measurements.

The sixth and seventh entries in the data rework statement are the zenith value and the cosecant coefficient of HPBW#1. Unless there has been a previous rework of the data, these values are not known and the values 0.14 and 0 are entered.

The last and eighth entry in a data rework statement is the value of the noise add,  $T_a$ , in kelvins. The magnitude for  $T_a$  has to be estimated from the printouts that occur using the MEAS program. The  $T_a$  used is the value that makes the graph of the center cut ( $N3=0$ ) reach 100%.

The rework process is an interactive process so that reasonable errors in entering the values in the rework data statement do not effect the ultimate results. Rather, a poor estimate may require an additional rework step.



#### 6.5.4 Deleting Data and Refitting Results

One of the most critical steps in reworking the data is in selecting the data sets to be deleted from the final results. The rule of thumb is "never remove a data set without a valid reason." This rule leaves a good deal of latitude, and nothing identifies a skilled metrologist more than information and care used to document the reasons for rejecting data. The design of the rework steps is arranged to aid in recognizing invalid data. We recommend that on the list of data sets deleted from the final results (indicated by a minus sign on the data list) the reason for each deletion be included with the final results. This practice encourages complete annotation of measurement anomalies as they occur during the measurement process and helps an outsider judge the reliability of measurement process. Following are some of the reasons we have used for deleting data. (1) The major reason for rejecting a data set is that one or more of the cuts in a set cannot be processed by the computer. To refit to a gaussian curve the computer uses a logarithmic method that requires that the peak value be greater than the sky temperature. In cases where the amplitude caused by the star is within the natural scatter or drift in temperatures of the data for the sky temperature, the program hangs up trying to take the logarithm of a negative number. This problem usually occurs because a cut is not taken sufficiently close to the center of the star to give maximum clearly greater than the normal scatter. To avoid this potential refit problem, attention is required to keep the data sets centered up on the star and/or to retake data that does not give a reasonable star signal to sky noise. (2) Another cause for rejecting data sets is due to recognized accidental measurement conditions such as missetting the antenna pointing, and incorrectly setting the down converter frequency or operating the frequency lock circuit out of range. If the problem is discovered in time, the data usually can be retaken. Otherwise, a comment is recorded on the data sheets and a comment is recorded on the offending measurement or a subsequent measurement. A bad antenna set is sometimes detected from a very poor fit of the set of five cuts to a gaussian curve, as noted on rework printouts. A difference on the printout of greater than 7% between the measured amplitude and the fit value generally indicates a problem in the antenna pointing. (3) Star data other than from Cas A are sometimes collected. Until the information and software in the ETMS are corrected to properly take advantage of these stars, this information is normally rejected from the results. (4) Star data



taken under abnormal or unusual measurement conditions are either omitted, or an explicit comment is given noting that data under abnormal conditions are retained. Abnormal conditions refer to conditions abnormal to the error analysis assumptions for the computer program. In particular, hail cloud conditions, rain, snow or condensed water particles in the air are conditions with which the error analysis in the computer program is not designed to deal. The atmospheric conditions between the star and the antenna are assumed to be uniform. Measurements, particularly at low angles where an atmospheric change occurs between the star and the antenna, may need to be rejected. (5) A final reason for rejecting data is that the data obviously do not fit with the reworked data collected. To spot an abnormal data set, several techniques are available. If the frequency is incorrectly recorded, this is usually most obvious on the  $G/T_a$  or Y-factor plot on a single frequency rework, because the coupling ratio of the noise add directional coupler is usually frequency dependent. Normally the NEF or NUF will not be frequency dependent, so an abnormal measurement set will often stand out most clearly on the NEF plot on an all-frequency rework. It is unusual for any measurement set to lie outside the error bars indicated on an all-frequency NEF plot. Any point that lies half again farther out than the error bar should be deleted. Any point that is near the error bars on the NEF all-frequency plot should be scrutinized on the rework sheets as to how well the measured data agree with the fit values. After examining the NEF all-frequency plot, all of the single frequency plots should be examined. The HPBW#1, and HPBW#2, and Y-factor plots have only one-sigma error bars, so one third of the data is expected to lie outside these error bars.

#### 6.5.5 Typical Rework Procedure

The typical rework for data at three frequencies would go as follows:

- (1) The data are collected onto a single rework tape.
- (2) The REWORK tape is loaded, lines 10 through 66 are deleted from the program, the data statements are entered for Rework #1 on file set 1 for an all-frequencies rework and Rework #2 on file set 2 for the lowest single frequency rework.
- (3) Key  $\emptyset$ , select option  $\emptyset$  RW to initiate the first level reworks. At the end of the reworks, the program stops at "the restart alternatives position" (TRAP).
- (4) The rework results are examined and the data sets to be deleted from Rework #1 are determined.
- (5) The rework results are reloaded into memory by selecting "1 LOAD" option.
- (6) The bad data sets are negated using the "3 DEL" option.
- (7) Re-

work #1.01, a third level rework is initiated using the "2 AUTO" TRAP option. (8) The Rework #2 results are reloaded into memory by selecting "1 LOAD" TRAP option. (9) The data sets to be deleted for the single frequency Rework #2 are negated using the "3 DEL" option. (10) Rework #2.01 is initiated with the "2 Auto" TRAP option. Steps (5-10) are needed only to obtain a reasonable fit for HPBW#1 and a valid estimate of  $T_a$  to be used in the upcoming second level reworks. If no data points are grossly out of line, steps (5-10) can be omitted. (11) Now second level reworks are needed which use the newly calculated HPBW#1 and  $T_a$  but do not take the time to fit the cuts again to gaussian curves. The second level rework is activated by the rework number in the rework data statements to be noninteger, so 1.1 replaces 1, and 2.1 replaces 2 as the data entries for the rework number. No other entry in the rework statements need be changed as the entries for HPBW #1 and  $T_a$  are not used (but must be entered anyway). (12) The second level rework is initiated via Key  $\emptyset$ , " $\emptyset$  RW" TRAP option. (13) After the second level reworks are complete, the bad data are again removed and the third level Rework #1.11 and Rework #2.11 are performed. (14) The summary tape is duplicated (keyboard command, DUP 5). (15) Rework data statements are entered, etc., for Reworks #3 and #4 for the remaining two measurement frequencies. (16) . . . (26) Repeat steps (3) through (13) for Rework #3 and Rework #4. When all the reworks are finished, the measurement conditions should be double checked. To do this the "SITE PREP" tape is loaded, and the measurement conditions are entered which correspond with those recorded on the G/T(dB) error table printed in the final rework. If all of the measurement conditions are correct, the reworks are finished.

#### 6.5.6 Interpretation of Results

The results of a measurement are printed out as a series of computer printouts as the last step of a rework (any level). The normal sequence of computer printouts is as follows: (1) Table of measurement sets incorporated into the rework; (2) table of the results of the least squares fits of G/T, G/Ta, HPBW#1, HPBW#2, Y-factor, NEF, and NUF versus the cosecant of the elevation, and versus elevation angle directly; (3) graph of NEF versus antenna elevation; (4) graph of NUF versus elevation; (5) graph of G/T versus elevation; (6) graph of G/Ta versus elevation; (7) graph of HPBW#1 versus elevation; (8) graph of HPBW#2 versus elevation; (9) Y-factor versus elevation; (10) table of NEF measurement errors, and measurement conditions at various elevations; (11)

similar NUF error table; (12) G/T error table; and (13) G/T<sub>a</sub> error table. Much of what appears on the printouts is self-explanatory, but the following remarks are included to better understand some of the printouts. Sample printouts are in the annotated computer printouts section (section 6.5.8).

Printout (2) is a table of results of a least squares fit of the various parameters versus elevation. Each parameter is fit to two different curves, viz. the parameter versus the cosecant of the elevation angle, and the parameter versus the elevation angle. The uncertainties listed are the one-sigma deviation of the measured points to the fit parameters.

Printouts (3)-(9) are a series of plots of various parameters versus antenna elevation. The measured points are plotted as a pound sign, and the measured value and the measurement label are listed on the right. The fit points are indicated with a period. At five-degree elevation intervals, error bars are plotted about the fit values, and the uncertainty is listed on the extreme right in lieu of the measurement label. The uncertainties listed with NEF, NUF, G/T, and T/T<sub>a</sub> include the errors labeled and listed in the error table printed in SITE PREP. For the plots of the measured half power beam width (HPBW) of the antenna-star convolution measurements and for the Y-factor, the error bars indicate the one-sigma deviation of the measured values from the fit value. HPBW#1 refers to the HPBW of the antenna pattern of a center cut along a line of constant declination, and HPBW#2 refers to the HPBW perpendicular to the line of constant declination.

For printouts (10)-(13) the results for NEF, NUF, G/T, and G/T<sub>a</sub> are listed in an alternate way that shows the error contribution details at various elevations. The parameters for the error calculation are printed. Most of the parameters can be identified with the corresponding parameter listed with more explanation with the SITE PREP error table. Other parameters are labeled with the computer variable table. The meaning of the computer variables are given in section 7. The entry labeled G-diff denotes the difference in (1) calculating the antenna gain using the antenna HPBW (see section 2.6) at zenith and using the measured G/T<sub>a</sub> curve to obtain G at a particular elevation, and (2) calculating antenna gain directly from HPBW at the given elevation. For further explanation of the various items in these tables, consult the annotated printouts.

### 6.5.7 Measurement Pitfalls

As with any computer printout, the results flow so easily and the valid results flow out with no more effort than the invalid results. It becomes such a bother to worry about which is which, that sometimes the effort is not taken, and the quality of the measurements slowly ebbs away. In the opposite direction, as certain operators gain more experience, they gain a sense of the quality and conditions of the results that transcends what can be programmed, or in some cases--even what can be easily communicated to others. My experience is that neither the computer results nor measurement intuition should be given the upper hand--but equal weight given to each. Documenting measurement conditions and explicitly stating measurement concerns will ultimately give rise to an improved measurement procedure. Certain measurement pitfalls occur regularly so they will be discussed explicitly.

#### 6.5.7.1 Extending Results Beyond Measurement Range

One should be particularly careful of extending the measurement results to antenna elevation angles beyond the elevation angles of any measured data sets. The computer printout tables print out the results at 10 degrees; but if no data sets were taken lower than 15 degrees elevation, the validity of the error uncertainty should be seriously examined. Measurement experience and reasonable measurement implications of the extended results need to be intelligently considered.

#### 6.5.7.2 Abnormal Atmospheric Conditions

The model used in the computer is that the atmosphere has a typical profile of temperature and humidity. Primarily, this excludes condensed water, or a dramatic change in temperature/humidity as encountered when a weather front moves near the measurement site. Problems with the model atmosphere are easiest to spot on an all-frequency NEF plot. The NEF of an earth terminal should be independent of frequency and antenna elevation within about 5% due to small changes in antenna gain with elevation, small changes of the system temperature due to increased thermal radiation into the antenna side lobes at low elevation angles, or small changes of system temperature with frequency. When abnormal atmospheric conditions exist, the error estimate listed on the computer printout may be too small, especially at low antenna elevation angles.



#### 6.5.7.3 Data Deletion

By the process of deleting the data sets farthest from the fit value, one could obtain a data set with relatively small deviation. Despite the appearance, the accuracy of this truncated data set is actually poorer (unless the data sets deleted were truly abnormal) because the measurement set is smaller. Because of the nature of random errors, the various measurement sets will naturally have somewhat greater or smaller variances, especially when the numbers of measurement data are small. The true uncertainty of the ideal measurement should not be variable.

#### 6.5.8 REWORK Annotated Printout

The annotated printout for the rework program follows.



## REWORK

\*-INSERT REWORK TAPE ~~into~~ INTERNAL CASSETTE UNIT

1000

PLH

PRINT ~~SEL~~ ON (1=YES) ?1

**REFERENCE DATE DATA=INT+SECT**

FROM LAST CHANGE OPTIONS=NO;

10.3

NBS1A.04    LOADER    <D1-F0> T2-F0:    Y.04.0002>T2-4.D1-4

— 4 —

Sym # 0.00

DE 23

PROG 276,5411 HARROGATE ENG

SAT: 1977 MAY 28 (1977.486)

7.550 GHz, 50.0 Ft. DISS

5/10

547

33.92 dB/K      48.16 dB/K

```
PROG CONSTS
```

02: 2.3

```
B2: 0.65      B3: 0.98      B5: 0.156451
B6: 7.59224E-03  B9: 170.827    B : 8.2943
```

```
C1: 4.54421E+18      C2: 1          C4: 1.688
C6: 54              C5: 245.421    C7: 0.23
C8: 0.1             C9: 0.2        C0: 0.5
C : 1977.4
```

D1: 0.1	D2: 1.34754	D3: 0.6
D5: 0.01615	D8: 0.75	D9: 0.18
D0: 0.0157867	D : 60	

F6: 5                      F8: 0.01                      F : 7.55

```
G4: 8.61841E-03      G5: 1.09405E-04      G6: 2.35159E-04
G : 1361510
```

H1: 0.151166 H5: 1 H9: 579.841

```

L5: 2.00457      L6: 2.17      L7: 1.00241
L8: 1.02064      L9: 0.013     L : 5

```

M : 10366

```

N1: 6
N : 1
N6: 3
N7: 500

```

```
03: 8.22653      06: 1.25      07: -0.0439
08: -0.0485
```

T : 131.343

4 : 5.5

Z1: 0.0377515

୨୩ ୨୪ ୨୫ ୨୬ ୨୭ ୨୮ ୨୯ ୩୦ ୩୧ ୩୨ ୩୩ ୩୪ ୩୫ ୩୬ ୩୭ ୩୮ ୩୯ ୪୦ ୪୧ ୪୨ ୪୩ ୪୪ ୪୫ ୪୬ ୪୭ ୪୮ ୪୯ ୫୦ ୫୧ ୫୨ ୫୩ ୫୪ ୫୫ ୫୬ ୫୭ ୫୮ ୫୯ ୬୦ ୬୧ ୬୨ ୬୩ ୬୪ ୬୫ ୬୬ ୬୭ ୬୮ ୬୯ ୭୦ ୭୧ ୭୨ ୭୩ ୭୪ ୭୫ ୭୬ ୭୭ ୭୮ ୭୯ ୮୦ ୮୧ ୮୨ ୮୩ ୮୪ ୮୫ ୮୬ ୮୭ ୮୮ ୮୯ ୯୦ ୯୧ ୯୨ ୯୩ ୯୪ ୯୫ ୯୬ ୯୭ ୯୮ ୯୯ ୧୦୦

# FIRST LEVEL REWORK

\* `0 RW,1LOAD,2AUTO,3=DEL,4G/T,5PLT/ERR(=NO): 0`  
`FETCH#010` *NORMALLY PRESS "END" Key to stop program and enter the appropriate rework data*

`6010 DATA 2,2,7.34,0.1208,0.0066,0.14,0.1165`

*normally two lines of data*

`LIST#000` *← should LIST DATA out and PASTE IT ON REWORK NOTEBOOK COVER*

`6000 REN 1#RWRY#,2=data SET,3=,4=,5=,6=HPB#00,7=,8=`

`6010 DATA 2,2,7.34,0.1208,0.0066,0.14,0.1165`

VALUE USED TO OBTAIN  
100% level on MEAS  
PRINT OUT

VIA SKY PROFILE

RESULT ON PRINT OUT

JUST A GOOD GUESS

WHEN TAKE MEASUREMENTS

\* TO PREVENT  
DEL 10,66

MEMORY SHORTAGE, suggest keyboard operation

`0 RW,1LOAD,2AUTO,3=DEL,4G/T,5PLT/ERR(=NO): 0` `90`

`SUM TAPE #(=NO): 0` `91`

`GRAPH DATA(0=NO)(=NO): 0` `91`

`START @ REWORK#(=NO): 0` `91`

*GRAPH OPTION USES A LOT OF PAPER!*

INFORMATION  
ABOUT EACH FILE

DETERMINES WHICH FRQ IS INCLUDED  
IN THE REWORK

ON SUMMARY TAPE IS PRINTED OUT  
WHETHER USED OR NOT

FILE 9  
LAS A

THUMAT261977276.250 HARKUGATE, ENG

RUN/SET 0

DW630.8148694,87012 DATA COLLECT T3-F0,D1-F14FREQ

FILE 10  
LAS A

THUMAT261977276.250 HARKUGATE, ENG

RUN/SET 1.02

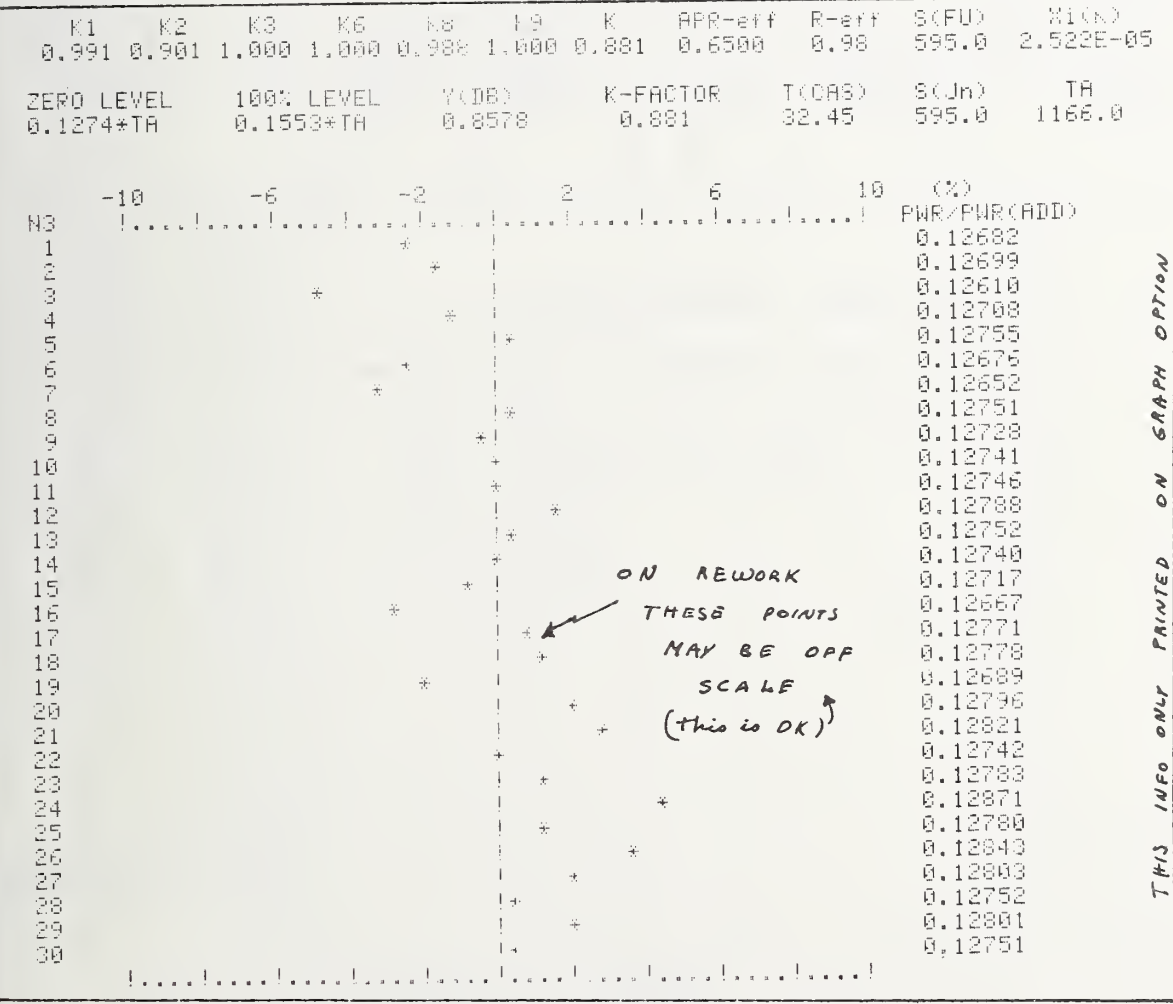
DW630.8148694,87012 DATA COLLECT T3-F0,D1-F14FREQ

SKY PROFILE  
MEAS

# REWORK (cont)

TAPE 1 data 2 REVISION 2.00  
 DEN, JPM, HOOFFER COMMENT STORED WITH DATA  
 IDENTIFIES PROGRAM REVISION FOR MEAS ROUTINE  
 IDENTIFIES SUBROUTINE USED DURING MEASUREMENT  
 STORED WITH DATA  
 IDENTIFIES PROGRAM REVISION FOR MEAS ROUTINE  
 IDENTIFIES SUBROUTINE USED DURING MEASUREMENT  
 STORED WITH DATA

TEMP 46.2 F DEW PT. 43.2 F REL HUMID 89.4 % WATER DENS 7.4 gm/m3 CLOUD COVER 4 WIND 0 mph  
 MEAS 6sec AZIMUTH 352.47 HFBW 0.1400 TIME(CHRS) 7.360 OFFSET 2.000 deg ELEV 83.40 CUT RUN SET H  
 1 2 7  
 PREDICTED  $\Delta T/T_a$  due to CNA  
 T-TA = 0.1208 + 0.00660 \* CSC L CAS A



THIS INFO ONLY PRINTED ON GRAPH OPTION

# REWORK (cont)

=====

TAPE 1	data 2	NBS10.42	REWORK	(D1-F16) T4-F12	REWORK	2.00
DFW-JPW:HOORAY!						

DW630.81<8694+8701> DATA COLLECT T3-F0+D1-F14; X.52<8699>T2-4;D1-4

-3-

RUN 1

PROG 276.266 HARROGATE, ENG  
THU: 1977 MAY 26 ( 1977.400)  
7.340 GHz, 60.0 Ft DISH

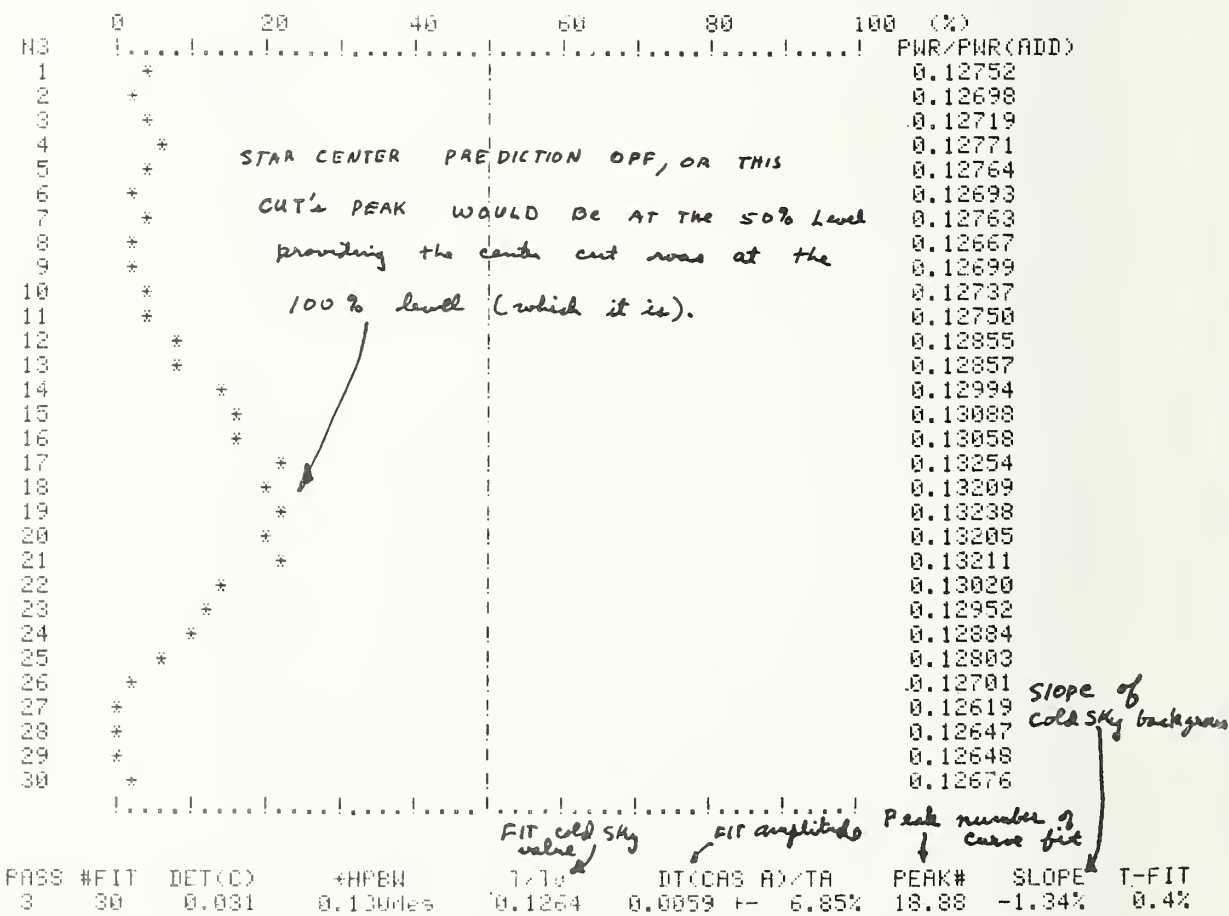
TEMP	DEW PT.	FEL HUMID	WATER DENS	CLOUD COVER	WIND
46.2 F	43.2 F	89.4 %	7.4 gm/m <sup>3</sup>	4	0 mph

=====

MEAS	AZIMUTH	HPBW	TIME(HRS)	OFFSET	ELEV	CUT	RUN	SET	N
6sec	314.40	0.1400	7.874	-0.168 deg	83.17	-2	1	2	8

dT= 0.028 T/TA = 0.1208 + 0.00660\*CSC L CAS A

PASS	#FIT	DET(C)	*HPBW	T/Ta	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
1	30	0.031	-	0.1262	0.0059 +- 8.01%	18.55	-1.23%	-4.4%
2	13	31.262	0.130deg	-	0.0061 +-#####	18.88	-	-
ZERO LEVEL		100% LEVEL	Y(DB)	K-FACTOR	T(CAS)	S(Jn)	TA	
0.1262*TA		0.1541*TA	0.8651	0.881	32.45	595.0	1166.0	



## REWORK (cont)

```
TAPE 1      data 2      HBS1D.42  RENDOK  D1-F16> T4-F12  RENDOK  2.00
          DEW, JPH, HODGFRY;
```

DU530, 81-8694, 8791> DATA COLLECT 13-F0, 31-F14, 31.52<8699>T2-4, D1-4

- 4 -

RUN 1

PROG 276.265 HARROGATE, ENG  
 THU: 1977 MAY 26 (1977.400)  
 7.340 GHz, 60.0 Ft IISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
46.2 F	43.2 F	89.4 %	7.4 gm/m3	4	0 mph

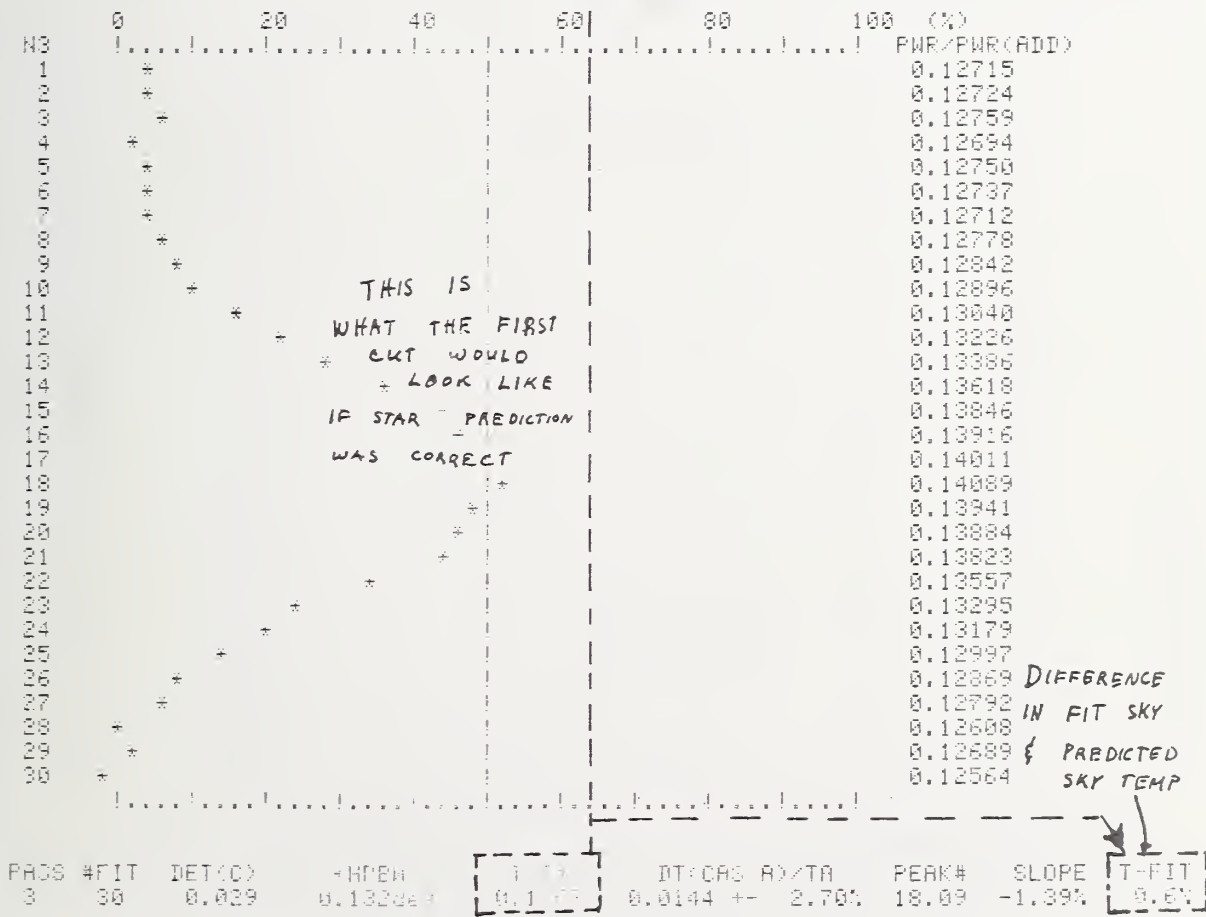
MERS	AZIMUTH	HPBW	TIME(CHRS)	OFFSET	ELEV	CUT	RUN	SET	N
6sec	312.37	0.1460	7.538	-0.129 deg	82.74	-1	1	2	9

$$dT = 0.028$$

$$T/TA = 0.1196 + 0.00660 \cdot CSC \cdot L$$

CAS A

PASS	#FIT	DET(C)	*HPBW	T/Ta	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
1	30	0.029	-	0.1262	0.0141 +- 4.28%	17.59	-0.71%	-0.2%
2	13	31.262	0.132deg	-	0.0146 +-####%	18.09	-	-
ZERO LEVEL		100% LEVEL		Y(DB)	K-FACTOR	T(CAS)	S(Jn)	TA
0.1262+TA		0.1540+TA		0.8675	0.881	32.45	535.0	1166.0



# REWORK (cont)

TAPE 1 data 2 NBS1D.42 REWORK <D1-F16> T4-F12 REWORK 2.00  
DFW, JPN, HOORAY!

DW630.81<8694,8701> DATA COLLECT T3-F0, D1-F14, X.52<8699>T2-4, D1-4

-5-

RUN 1

PROG 276.266 HARROGATE, ENG  
THU: 1977 MAY 26 (1977.400)  
7.340 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
46.2 F	43.2 F	89.4 %	7.4 gm/m <sup>3</sup>	4	0 mph

MEAS	AZIMUTH	HPBW	TIME(HRS)	DECLINATION	OFFSET FROM UNBIASED STAR CENTER PREDICTION	ELEV	CUT	RUN	SET	N
6sec	310.37	0.1400	8.014	-0.090 deg		82.23	0	1	2	10

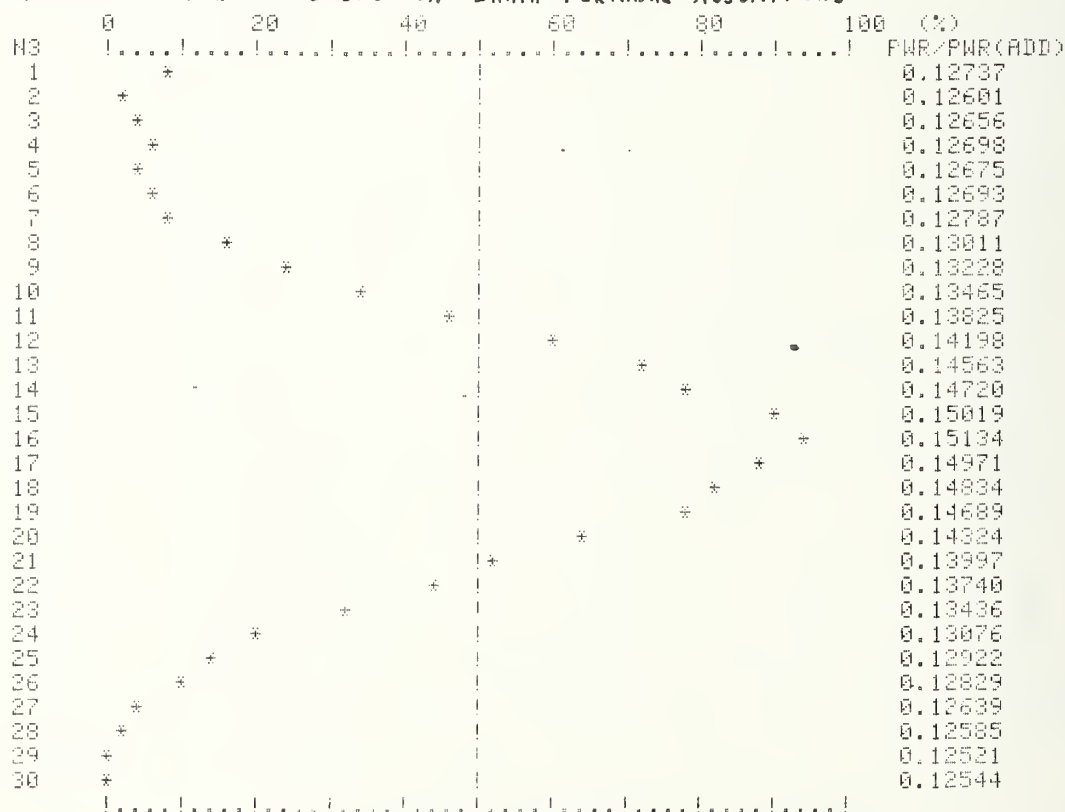
dt = 0.028 T/TA = 0.1195 + 0.00660\*OSC L CAS A

PASS	#FIT	DET(C)	*HPBW	T/Ta	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
1	30	0.027	-	0.1254	0.0252 +- 2.93%	16.06	-0.07%	-2.8%
2	13	31.262	0.130deg	-	0.0254 +- #####	15.98	-	-

ZERO LEVEL	100% LEVEL	Y(DD)	K-FACTOR	T(CAS)	S(Jn)	TA
0.1254*TA	0.1532*TA	0.8703	0.881	32.45	595.0	1166.0

PREDICTED VALUES BASED ON EARTH TERMINAL ASSUMPTIONS



PASS	#FIT	DET(C)	*HPBW	T/Ta	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
3	30	0.027	0.138deg	0.1195	0.0231 +- 3.37%	15.98	0.18%	0.5%



# REWORK (cont)

TAPE 1 data 2 NBSID:42 PERIOD: I1-F16 T4-F12 REWORK 1.00  
DFW:JFW:HOOFAY:

DN530.8148694,8701> DATA COLLECT TO END: I1-F14: ...52 8695 I2-F14

-E-

RUN 1

PRG: 176.266 HARDCODE: ENG  
THU: 1977 MAY 12 / 1977.400  
7.340 GHz 60.0 PK DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
46.2 F	43.2 F	89.4 %	7.4 gm/m3	4	0 mph

MERS	AZIMUTH	HPBW	TIME (HRS)	OFFSET	ELEV	CUT	RUN	SET	N
6sec	308.88	0.1400	8.073	-0.051 deg	81.77	1	1	2	11

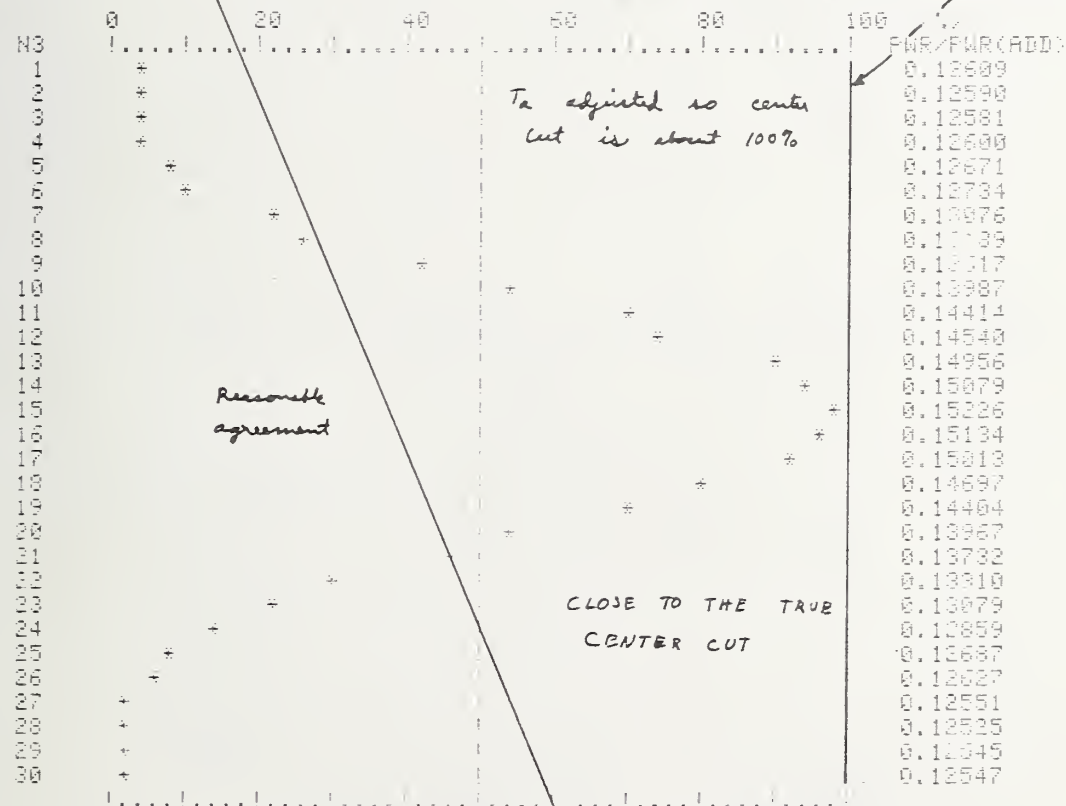
DT= 0.028

T/TA = 0.1188 + 0.00660\*OSC L

CAS A

PASS	#FIT	DET(C)	*HPBW	T/TA	DT/CAS A)/TA	PEAK#	SLOPE	T-FIT
1	30	0.027	-	0.1247	0.0272 +- 3.87%	14.67	1.34%	-2.5%
2	13	31.262	0.137deg	-	0.0276 +- 3.87%	15.29	-	-
ZERO LEVEL		100% LEVEL	Y:08%	K-FACTOR	T(CAS)	S(Jn)	TA	
0.1247*TA		0.1526*TA	0.8746	0.881	32.45	535.0	1185.9	

THE VALUE OF T<sub>a</sub> DETERMINES SCALE OF GRAPH



PASS	#FIT	DET(C)	*HPBW	T/TA	DT/CAS A)/TA	PEAK#	SLOPE	T-FIT
3	30	0.027	0.137deg	0.1247	0.0272 +- 3.87%	15.29	-0.72%	1.3%

# REWORK (cont)

TAPE 1 data 2 NBS1D.42 REWORK <D1-F16> T4-F12 REWORK 2.00  
DFW, JFW, HOOBAY!

DW63C.81<8694,8701> DATA COLLECT T3-F0, D1-F14, %.52<8699>T2-4, D1-4

-7-

RUN 1

PROG 276.265 HARROGATE, ENG  
THU: 1977 MAY 26 (1977.400)  
7.340 GHz, 60.0 Ft DISH

TEMP 46.2 F DEW PT. 43.2 F REL HUMD 89.4 % WATER DENS 7.4 gm/m3 CLOUD COVER 4 WIND 0 mph

## TIME BETWEEN MEASUREMENTS

## MEASUREMENT IDENTIFICATION

MEAS	AZIMUTH	HPBW	TIME(CHRS)	OFFSET	ELEV	CUT	RUN	SET	N
6sec	307.56	0.1400	8.144	-0.012 deg	81.30	2	1	2	12

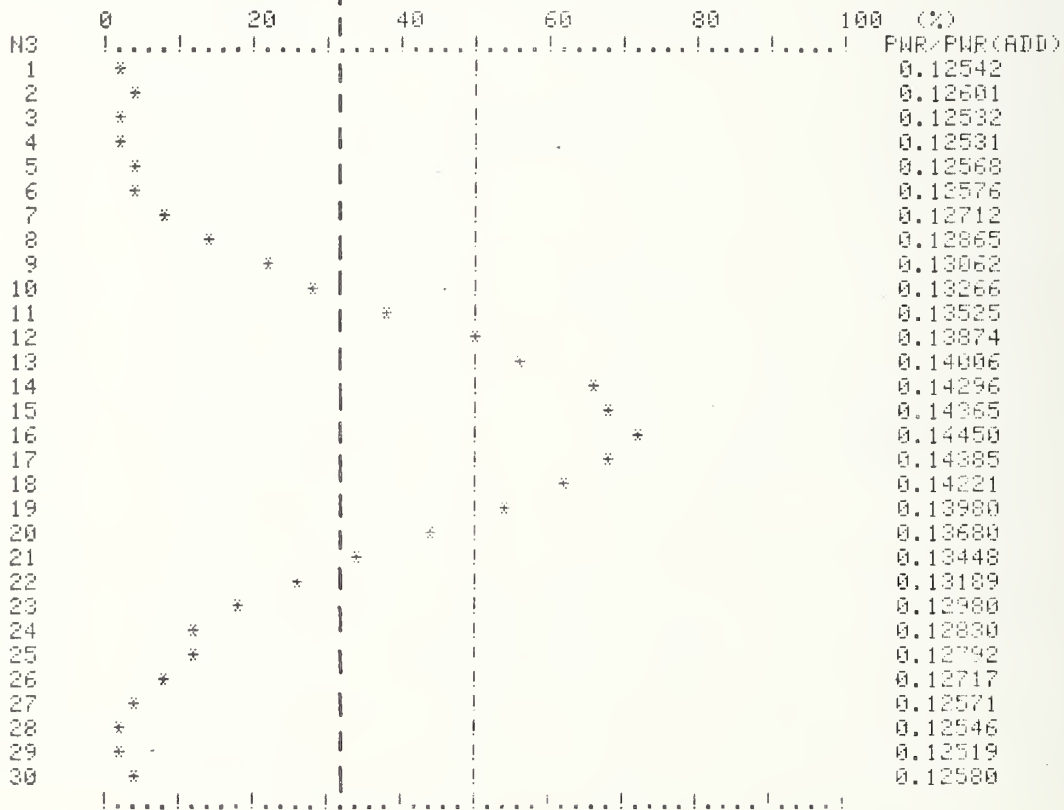
dt= 0.028

## PREDICTED

T.TA = 0.1181 + 0.00660\*OSC L

CAS A

PASS	#FIT	DET(C)	*HPBW	T/T0	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
1	30	0.027	-	0.1247	0.0192 +- 3.55%	16.16	-0.55%	-0.0%
2	13	31.262	0.133deg	-	0.0196 +-#####	15.64	-	-
ZERO LEVEL		100% LEVEL	Y(DB)	K-FACTOR	T(CAS)	S(Jn)	TA	
0.1247*TA		0.1526*TA	0.8746	0.881	32.45	595.0	1166.0	



## MEASURED

PASS	#FIT	DET(C)	*HPBW	T/T0	DT(CAS A)/TA	PEAK#	SLOPE	T-FIT
3	30	0.027	0.123deg	0.1250	0.0191 +- 2.43%	15.64	0.67%	1.5%

# REWORK (cont)

|||||

TAPE 1 data 2 NBS1D.42 REWORK D1-F16; T4-F13 REWORK 2.00  
DFW, JFW, HOOPTV

DW63C.81<8694,8781> DATA COLLECT T3-F2, D1-F14; W.52<8699>T2-4, D1-4

-8-

RUN 1

PROG 276.266 HARROGATE, ENG  
THU: 1977 MAR 26 (1977.400)  
7.340 GHz; 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
46.2 F	43.2 F	89.4 %	7.4 gm/m <sup>3</sup>	4	0 mph

|||||

BEST FIT FOR 5 CUTS ELEV OF 0 CUT

REWORK	FILE	TAPE	TIME(Hrs)	EFF AREA	Ta(K)	SKY BRIGHT	ELEV(deg)	RUN	SET
2.0	3	1	8.014	170.8 m <sup>2</sup>	1166.0	2.31 K	82.2	1	2

PASS	#FIT	DET(C)	*HPBW	T/Ta	DT(CAS A)/Ta	DECL OFFSET: CAS A
1	5	15.386	0.142deg	0.1255	0.0274 +- 1.91%	-0.063deg
2	5	7.208	0.142deg	0.1255	0.0276 +- 0.91%	-0.063deg

*HPBW#1	Y-FACTOR	T(K)	DT(CAS A)	G(dB)	G/T(dB)	NEF	NUF
0.139deg	1.2195	146.33	32.13 K	61.05	39.40	2.346kFU	2.386kFU

|||||

100\*(DATA-FIT)/(MAX DT(CAS A)/TA)

CUT	-2	-1	0	1	2
	0.86%	-1.66%	0.79%	-0.02%	0.04%

CONDITIONS AND ASSUMPTIONS USED IN CALCULATION OF G, G/T, NEF, & NUF

\*HPBW #1 = 0.14000 + 0.000000 COS L = 0.1400 (ant HPBW = 0.1390)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	W(K)
0.991	0.901	1.000	1.000	0.588	1.000	0.881	0.6500	0.98	535.0	2.522E-05

SITE ELEV	oxy attn	water attn	zenith attn	REFR #1	REFR #2	ant-DIAM
0.500 km	0.03209 dB	0.0060 dB/dens	0.0381 dB	1.062	0.0138	60.0 ft

E TC.

# REWORK (cont)

## 2<sup>ND</sup> LEVEL REWORK

0 RW:1LOAD,2AUTO,3=DEL:4G T:5PLT:ERR: (NO): 0

\* END

FETCH6000

6000 REM 1=RWK#, 2=data SET, 3=F, 4=T:TA090, 5=csc, \*6=HPBW090, \*7=csc, \*8=Ta

6010 DATA 12.2, 2, 7.385, 0.1200, 0.0066, 0.14, 0, 1166

NON INTEGER REWORK ACTIVATES 2<sup>ND</sup> LEVEL REWORK

LIST6000

6000 REM 1=RWK#, 2=data SET, 3=F, 4=T:TA090, 5=csc, \*6=HPBW090, \*7=csc, \*8=Ta

6010 DATA 12.2, 2, 7.385, 0.1200, 0.0066, 0.14, 0, 1166

\* KEY 0

0 RW:1LOAD,2AUTO,3=DEL:4G T:5PLT:ERR: (NO): 0

SUM TAPE # ( =NO): 10

GRAPH DATA (0=NO) ( =NO): 0

START @ REWORK# ( =NO): 12.21 912

INFORMATION ON EACH SUMMARY TAPE FILE IS LISTED

FILE 9

CHS A

TUEMAY101977276.5411CAMP ROBERTS, ANT#1 RUN/SET 0  
DW630.76<8694,8701> DATA COLLECT T3-F0,D1-F14FREQ 0

FILE 10

CHS A

TUEMAY101977276.5411CAMP ROBERTS, ANT#1 RUN/SET 1.02  
DW630.76<8694,8701> DATA COLLECT T3-F0,D1-F14FREQ 7.5

FILE 11

CHS A

TUEMAY101977276.5411CAMP ROBERTS, ANT#1 RUN/SET 1.03  
DW630.76<8694,8701> DATA COLLECT T3-F0,D1-F14FREQ 7.385

TAPE 10 data 2 NB51D.43 REWORK (D1-F16) T4-F12 REWORK 12.20  
ANT SET PROBLEMS

DW630.76<8694,8701> DATA COLLECT T3-F0,D1-F14, 11.52<8699>T2-4,D1-4

RUN 1

PROG 276.5411 CAMP ROBERTS, ANT#1  
TIME 29.7 MAY 10 ( 1977.400)  
7.385 GHz 60.0 Ft DISH

SPECIFIED REWORK FREQ

## REWORK (cont)

TEMP	DEW PT.	REL. HUMID.	WATER DENS.	CLOUD COVER	WIND
49.3 F	43.2 F	79.7 %	7.3 gm/cm3	2	0 mph

BEST FIT FOR 5 CUTS

REWORK	FILE	TAPE	TIME(Hrs)	EFF AREA	Ta(K)	SKY	BRIGHT	ELEV(deg)	PUN	SET
12.2	9	10	7.559	170.8 m <sup>2</sup>	321.1	9.78	K	13.3	1	3

PASS	#FIT	DET(C)	+HPBM	T-T <sub>0</sub>	DT(CAS A)/T <sub>0</sub>	DECL OFFSET: CAS A
1	5	21.735	0.178deg	0.0029	0.0906 +- 5.65%	0.075deg
2	5	6.350	0.178deg	0.0039	0.0968 +- 5.21%	0.075deg

+HPBW#1	Y-FACTOR	T(K)	DT(CAS A)	G(dB)	G/T(dB)	NEF	NUF
0.000deg	32.2949	0.93	29.14 K	60.98	61.29	-0.0088KJ	-0.0088KJ

[illegible]
$$100 \times (\text{DATA} - \text{FIT}) / (\text{MAX DT}(\text{CAS A}) / \text{TA})$$

CUT	-2	-1	0	1	2
	-4.26%	9.46%	-4.65%	-2.03%	1.49%

```
*HPBW #1 = 0.14741 + 0.000241 CSC L = 0.1485 (ant HPBW = 0.1479)
```

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	$\Sigma(K)$
0.563	0.911	1.000	1.000	0.947	0.395	0.827	0.6500	0.98	532.2	2.326E-05

SITE ELEV	oxy attn	water attn	zenith attn	REFR #1	REFR #2	ant-DIAM
0.500 km	0.03176 dB	0.00660 dB/dens	0.0378 dB	1.955	0.0130	60.0 ft

## CONDITIONS

FOR 2<sup>nd</sup> LEVEL REWORK, CUTS ARE NOT REFIT, BUT SETS ARE

```
FILE 12      TUEMAY101971270.5411CAMP ROBERTS, ANT#1      RUN/SET 1.04
CAS A       DW630.76-8294.8741 DATA COLLECT 13-F0-D1-F14FREQ 7.6
```

```
FILE 13      TUEBAY101977206.54110AMP ROBERTS, ANT#1      RUN/SET 1.05
CAS A      DW630.7610694.8701> DATA COLLECT 13-F0.D1-F14FREQ 7.675
```

```
FILE 14      TUEMAY10190727C.04110000 ROBERTS, ANTH1      RUN/SET 1.06
CAS A        DW63C.76-8604.0701> DATA COLLECT T3-F0, D1-F14FREQ 7.385
```

DW63C.76<8694,8701> DATA COLLECT T2-F9,D1-F14, X.52<8699>T2-4,D1-4

EJIM 1

2

BEST FIT FOR 5 CUTS

PASS	#FIT	DET(C)	*HPBW	T/T <sub>0</sub>	DT(CAS A)/T <sub>0</sub>	DECL OFFSET: CAS A
1	5	21.342	0.158deg	0.0005	0.0862 +- 7.92%	0.068deg
2	5	6.618	0.158deg	0.0005	0.0890 +- 5.37%	0.068deg

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

$$100 * (\text{DATA-FILE}) / (\text{MAX DT}(\text{CASE}) / \text{TA})$$

CUT	-2	-1	0	1	2
	4.31%	-9.58%	5.80%	-0.10%	-0.43%

```
*HPBW #1 = 0.14741 + 0.000241 CSC L = 0.1480 (ant HPBW = 0.1474)
```

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	$\chi^2(K)$
0.379	0.911	1.000	1.000	0.969	0.998	0.863	0.6500	0.98	592.2	2.427E-05

SITE ELEV	oxy attn	water attn	zenith attn	REFR #1	REFR #2	ant-DIAM
0.500 km	0.03183 dB	0.0060 dB/dens	0.0379 dB	1.056	0.0130	60.0 ft

5



# REWORK (cont)

## 3<sup>rd</sup> LEVEL REWORK

```
0 RW:1LORD:3AUTO:3=DEL:4G/T:5PLT:ERR/ =NO): 0
SOP TAPE # =NO): 0
DATA SET:1=1ST:2=2nd: =NO): 1
```

1

```
0 RW:1LORD:3AUTO:3=DEL:4G/T:5PLT:ERR/ =NO): 0
DEL:RUN:SET:0=EXIT:11.00
DEL:RUN:SET:0=EXIT:11.00
```

2

- 1) THE DEL OPERATION PUTS A NEGATIVE SIGN WITH THE ELEVATION ANGLE.
- 2) In the rework, negative elevation angles are not reworked.
- 3) To reobtain the data, a second DEL operation returns the + sign, and then the data is reworked.

```
0 RW:1LORD:3AUTO:3=DEL:4G/T:5PLT:ERR/ =NO): 0
TEMP(F): =NO): 53
DEN PT(F): =NO): 30.9
PENOPK #(: =NO): 15.01
```

2

DIGIT TO INDICATE  
WHICH 3<sup>rd</sup> LEVEL REWORK

# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK 9848,0006> T4-F12,D1-F16 REWQRK 15.01

NBS1A.01 LOADER 9913,0003 T2-F0,D1-F0, X.04(0002)>T2-4,D1-4

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RUN 3

PPOG 276.5407 FT. DETRICK ANT #1

THU: 1976 DEC 2 ( 1976.920)

7.319 GHz; 60.0 Ft DISH

THIS DATA POINT IS NOT INCLUDED IN THE REWORK

RUN/SET	STAR	ELEV	G/T	G/TA	HPBW#1	HPBW#2	FREQ	Y-fac	NEF	NUF
33.08	CAS A	-18.3	40.084	31.891	0.136	0.135	7.319	1.248	1.945	2.065
3.02	CAS A	9.0	40.240	32.524	0.143	0.151	7.319	1.239	1.816	2.051
2.03	CAS A	11.1	40.471	32.422	0.145	0.136	7.319	1.259	1.736	1.923
3.05	CAS A	12.4	40.516	32.590	0.139	0.120	7.319	1.265	1.726	1.893
2.07	CAS A	24.9	41.039	32.535	0.144	0.130	7.319	1.315	1.559	1.640
3.11	CAS A	26.6	40.799	32.398	0.146	0.129	7.319	1.299	1.654	1.732
3.13	CAS A	38.4	41.096	32.548	0.142	0.128	7.319	1.324	1.552	1.606
1.06	CAS A	61.2	41.020	32.378	0.140	0.139	7.319	1.322	1.590	1.628
33.09	CAS A	64.6	40.848	32.157	0.143	0.164	7.319	1.310	1.657	1.695

# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK 19848.0036 T4-F12,D1-F16 REWORK 15.01

NBS1A.01 LOADER <9913.0000 T2-F0,D1-F0, M.04<0000>T2-4,D1-4

-56-

RUN 3

PROG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1975.920)  
7.319 GHz, 60.0 Ft DISH

# PTS = 8

G/T(dB) = ( 41.1930 +- 0.1258) + ( -0.14234 +- 0.02341)\*CSC L  
G/T(dB) = ( 40.4494 +- 0.2434) + ( 0.00980 +- 0.00419)\*ELEV

G/TA(dB) = ( 32.3407 +- 0.1315) + ( 0.03342 +- 0.02446)\*CSC L  
G/TA(dB) = ( 32.5840 +- 0.1057) + ( -0.00452 +- 0.00182)\*ELEV

HPBW#1(deg) = ( 0.1428 +- 0.0027) + ( -0.00001 +- 0.00049)\*CSC L  
HPBW#1(deg) = ( 0.1435 +- 0.0026) + ( -0.00002 +- 0.00004)\*ELEV

HPBW#2(deg) = ( 0.1385 +- 0.0153) + ( -0.00045 +- 0.00234)\*CSC L  
HPBW#2(deg) = ( 0.1279 +- 0.0136) + ( 0.00030 +- 0.00023)\*ELEV

Y-factor = ( 1.3394 +- 0.0086) + ( -0.01546 +- 0.00161)\*CSC L  
Y-factor = ( 1.2562 +- 0.0221) + ( 0.00114 +- 0.00038)\*ELEV

NEF(kFU) = ( 1.5377 +- 0.0497) + ( 0.04003 +- 0.00925)\*CSC L  
NEF(kFU) = ( 1.7399 +- 0.0010) + ( -0.00253 +- 0.00139)\*ELEV

NUF(kFU) = ( 1.5323 +- 0.0511) + ( 0.07731 +- 0.00951)\*CSC L  
NUF(kFU) = ( 1.9416 +- 0.1198) + ( -0.00550 +- 0.00206)\*ELEV

# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK <9848,0006> T4-F12,D1-F16 REWORK 15.01

NBS1A.01 LOADER <9913,0003> T2-F0,D1-F0, X.04<0002>T2-4,D1-4

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RUN 3

PRG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.920)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DEHS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

=====

. = FIT # = CAS A @ = CYG A 0 = TAU A + = ORI A

FIT TO 8 DATA  
NEF(KFU) = ( 1.5377 +- 0.0497 ) + ( 0.04003 +- 0.00925 ) \* CSC L

ELEV	1.000	1.200	1.400	1.600	1.800	2.000	(UNIT= 0.0200)	VALUE	RUN/SET
9.0	!	!	!	!	!	!	!	1.8160	3.02
10							!	1.7682	+- 0.243
11.1							!	1.7357	2.03
12.4							!	1.7260	3.05
15							!	1.6924	+- 0.201
20							!	1.6548	+- 0.177
24.9							!	1.5594	2.07
25							!	1.6324	+- 0.164
26.6							!	1.6545	3.11
30							!	1.6178	+- 0.155
35							!	1.6075	+- 0.149
38.4							!	1.5524	3.13
40							!	1.6000	+- 0.145
45							!	1.5943	+- 0.142
50							!	1.5900	+- 0.140
55							!	1.5866	+- 0.138
60							!	1.5839	+- 0.137
61.2							!	1.5897	1.06
64.6							!	1.6565	33.09

!.....!.....!.....!.....!.....!.....!.....!.....!.....!

# REWORK (cont)

TAPE 9 data 2 NBS1B.41 REWORK <9848,0006> T4-F12,D1-F16 REWORK 15.01

NBS1A.01 LOADER <9913,0003> T2-F8,D1-F8, X.04<0002>T2-4,D1-4

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RUN 3

PROG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.929)  
7.319 GHz, 60.0 Ft MISH

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph
=====					
. = FIT	# = CAS A	@ = CYG A	0 = TRU A	+ = ORI A	

FIT TO 8 DATA  
NUF(kFU) = ( 1.5323 +- 0.0511 ) + ( 0.07731 +- 0.00951 ) \* COS L

ELEV	1.000	1.400	1.800	2.200	2.600	3.000	(UNIT= 0.0400)	VALUE	RUN/SET
9.0	!.....!.....!.....!.....!.....!.....!.....!.....!			#				2.8507	3.02
10			-----					1.9775 +- 0.272	
11.1			#					1.9234	2.03
12.4			#					1.8925	3.05
15			-----					1.8310 +- 0.218	
20			-----					1.7583 +- 0.188	
24.9			#					1.6401	2.07
25			-----					1.7152 +- 0.172	
26.6			#					1.7319	3.11
30			-----					1.6869 +- 0.163	
35			-----					1.6671 +- 0.156	
38.4			#					1.6061	3.13
40			-----					1.6526 +- 0.151	
45			-----					1.6416 +- 0.147	
50			-----					1.6332 +- 0.145	
55			-----					1.6267 +- 0.143	
60			-----					1.6216 +- 0.141	
61.2			#					1.6282	1.06
64.6			#					1.6945	33.09
	!.....!.....!.....!.....!.....!.....!.....!.....!								

# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK (5848,0006) T4-F12,D1-F16 REWORK 15.01

NBS1A.01 LOADER (X9913,0000) T3-F0,D1-F0; X.04(0000)T2-F4,D1-F4

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. RUN 3

PROG 27c.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 (1976.920)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

=====

. = FIT # = CAS A @ = CYG A 0 = TAU A + = ORI A

FIT TO 8 DATA  
G/T(dB) = ( 41.1930 +- 0.1258) + ( -0.14234 +- 0.02341)\*CSC L

ELEV	40.000	40.400	40.800	41.200	41.600	42.000	(UNIT= 0.0400)	VALUE	RUN-SET
9.0	!.....!.....!.....!.....!.....!.....!.....!	#.						40.2403	3.02
10	-----!.....!.....!.....!.....!.....!.....!.....!							40.3733	+- 0.543
11.1		.#						40.4714	2.03
12.4		#						40.5162	3.05
15	!-----!.....!.....!.....!.....!.....!.....!.....!							40.6430	+- 0.458
20		!-----!.....!.....!.....!.....!.....!.....!.....!						40.7768	+- 0.418
24.9			.#					41.0092	2.07
25		!-----!.....!.....!.....!.....!.....!.....!.....!						40.8562	+- 0.395
26.6			#.					40.7991	3.11
30		!-----!.....!.....!.....!.....!.....!.....!.....!						40.9083	+- 0.380
35		!-----!.....!.....!.....!.....!.....!.....!.....!						40.9448	+- 0.369
38.4			.#					41.0961	3.13
40		!-----!.....!.....!.....!.....!.....!.....!.....!						40.9716	+- 0.362
45		!-----!.....!.....!.....!.....!.....!.....!.....!						40.9917	+- 0.356
50		!-----!.....!.....!.....!.....!.....!.....!.....!						41.0072	+- 0.352
55		!-----!.....!.....!.....!.....!.....!.....!.....!						41.0192	+- 0.343
60		!-----!.....!.....!.....!.....!.....!.....!.....!						41.0286	+- 0.346
61.2			#.					41.0199	1.06
64.6			#					40.8476	33.09
	!.....!.....!.....!.....!.....!.....!.....!								



# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK (9848,0006): T4-F12,D1-F16 REWORK 15.01

NBS1A.01 LOADER (9913,0003): T2-F0,D1-F0. (1.0410002)T2-4,D1-4

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RUN 3

PROG 376.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.920)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

=====

. = FIT      # = OBS A      @ = CYC A      0 = TRU A      + = ORI A

FIT TO 8 DATA  
G/TA(dB) = ( 32.3407 +- 0.1315) + ( 0.03342 +- 0.02446)\*CSC L

ELEV	31.000	31.400	31.800	32.200	32.600	33.000	(UNIT= 0.0400)	VALUE	RUN/SET
9.0	!	!	!	!	!	!		32.5243	3.02
10	!	!	!	!	!	!	#	32.5332 +- 0.545	
11.1	!	!	!	!	!	!	#	32.4220	2.03
12.4	!	!	!	!	!	!	#	32.5098	3.05
15	!	!	!	!	!	!		32.4698 +- 0.461	
20	!	!	!	!	!	!		32.4384 +- 0.420	
24.9	!	!	!	!	!	!	#	32.5345	2.07
25	!	!	!	!	!	!		32.4198 +- 0.397	
26.6	!	!	!	!	!	!	#	32.3977	3.11
30	!	!	!	!	!	!		32.4075 +- 0.382	
35	!	!	!	!	!	!		32.3990 +- 0.372	
38.4	!	!	!	!	!	!	#	32.5480	3.13
40	!	!	!	!	!	!		32.3927 +- 0.364	
45	!	!	!	!	!	!		32.3880 +- 0.359	
50	!	!	!	!	!	!		32.3843 +- 0.354	
55	!	!	!	!	!	!		32.3815 +- 0.351	
60	!	!	!	!	!	!		32.3793 +- 0.348	
61.2	!	!	!	!	!	!	#	32.3776	1.06
64.6	!	!	!	!	!	!	#	32.1573	33.09

!.....!.....!.....!.....!.....!.....!.....!.....!.....!

# REWORK (cont)

TAPE 9 data 2 HBS10.41 REWORK 9848,0006> T4-F12,D1-F16 REWORK 15.01

HBS1A.01 LOADER <9913,0003> T2-F0,D1-F0, %.04<0002>T2-4,D1-4

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RUN 3

PROG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.920)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	49.0 %	4.5 gm/m <sup>3</sup>	74	0 mph
=====					
. = FIT	# = CAS A	@ = CYG A	0 = TRU A	+ = ORI A	

FIT TO 8 DATA  
HPBW#1(deg) =( 0.1428 +- 0.0027) + ( -0.00001 +- 0.00049)\*CSC L

	0.130	0.134	0.138	0.142	0.146	0.150	(UNIT= 0.0004)	
ELEV	!	!	!	!	!	!	VALUE	RUN/SET
9.0				#			0.1427	3.02
10				!-----!-----!			0.1427	+- 0.002
11.1				.	#		0.1446	2.03
12.4			#				0.1390	3.05
15				!-----!-----!			0.1427	+- 0.002
20				!-----!-----!			0.1427	+- 0.002
24.9				.	#		0.1444	2.07
25				!-----!-----!			0.1427	+- 0.002
26.6				.		#	0.1462	3.11
30				!-----!-----!			0.1427	+- 0.002
35				!-----!-----!			0.1427	+- 0.002
38.4			#.				0.1423	3.13
40				!-----!-----!			0.1427	+- 0.002
45				!-----!-----!			0.1427	+- 0.002
50				!-----!-----!			0.1427	+- 0.002
55				!-----!-----!			0.1427	+- 0.002
60				!-----!-----!			0.1427	+- 0.002
61.2			#	.			0.1396	1.06
64.6				.#			0.1431	33.09
	!	!	!	!	!	!		

# REWORK (cont)

TAPE 9    data 2    NBS10.41    REWORK    (9848,0006) T4-F12,D1-F16    REWORK 15.01

NBS1A.01    LOADER    (9913,0000) T2-F8,D1-F8,    (1.0410002)T2-4,D1-4

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RUN 3

PROG 276.5407    FT. DETRICK ANT #1  
THU: 1976 DEC 2    ( 1976.920)  
7.319 GHz, 69.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

=====

. = FIT    # = CAS A    @ = CYG A    0 = TRU A    + = ORI A

FIT TO 8 DATA  
HPBW#2(deg) = ( 0.1385 +- 0.0153 ) + ( -0.00045 +- 0.00284 ) \* CSC L

ELEV	0.120	0.130	0.140	0.150	0.160	0.170	(UNIT= 0.0010)	VALUE	RUN/SET
9.0	!	!	!	!	!	!	!	0.1507	3.02
10	!	!	!	!	!	!	!	0.1359 +- 0.015	
11.1			#					0.1364	2.03
12.4	#		.					0.1204	3.05
15		!	!	!	!	!	!	0.1367 +- 0.015	
20		!	!	!	!	!	!	0.1372 +- 0.015	
24.9			#					0.1295	2.07
25		!	!	!	!	!	!	0.1374 +- 0.015	
26.6			#					0.1289	3.11
30		!	!	!	!	!	!	0.1376 +- 0.015	
35		!	!	!	!	!	!	0.1377 +- 0.015	
38.4			#					0.1277	3.13
40		!	!	!	!	!	!	0.1378 +- 0.015	
45		!	!	!	!	!	!	0.1378 +- 0.015	
50		!	!	!	!	!	!	0.1379 +- 0.015	
55		!	!	!	!	!	!	0.1379 +- 0.015	
60		!	!	!	!	!	!	0.1380 +- 0.015	
61.2			.	#				0.1390	1.06
64.6			.			#		0.1641	33.09
	!	!	!	!	!	!	!		

# REWORK (cont)

TAPE 9 data 2 HBS1B.41 REWORK (19848,0006) T4-F12,D1-F16 REWORK 15.01

HBS1A.01 LOADER 9913,0003, T2-F0,D1-F0, N.04,0002>T2-4,D1-4

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RUN 3

PROG 276.5437 FT. DETPICK ANT #1  
THU: 1976 DEC 2 (1976.929)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

=====

. = FIT # = OBS A @ = CYG A 0 = TAU A + = ORI A

FIT TO 8 DATA

Y-factor = 1.3394 +/- 0.0036 / + (-0.01546 +/- 0.00161)\*CSC L

ELEV	1.200	1.240	1.280	1.320	1.360	1.400	(UNIT= 0.0040)	VALUE	RUN/SET
9.0	!	!	!	!	!	!		1.2394	3.02
10		#						1.2504	+ 0.008
11.1		!-.-!						1.2593	2.03
12.4			#					1.2653	3.05
15				!-.-!				1.2796	+ 0.008
20					!-.-!			1.2942	+ 0.008
24.9						#		1.3148	2.07
25					!-.-!			1.3028	+ 0.008
26.6					#			1.2988	3.11
30					!-.-!			1.3085	+ 0.008
35					!-.-!			1.3124	+ 0.003
38.4						#		1.3243	3.13
40					!-.-!			1.3153	+ 0.008
45					!-.-!			1.3175	+ 0.008
50					!-.-!			1.3192	+ 0.008
55					!-.-!			1.3205	+ 0.008
60					!-.-!			1.3215	+ 0.008
61.2						#		1.3218	1.06
64.6						#		1.3095	33.09

!.....!.....!.....!.....!.....!.....!.....!.....!

# REWORK (cont)

TAPE 9 data 2 NBS1D.41 REWORK .9848,0006. T4-F12,D1-F16 REWORK 15.01  
NBS1A.01 LOADER <9913,0003> T2-F0,D1-F0, X.04<0002>T2-4,D1-4

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RUN 3

PROG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.920)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

FIT TO 8 DATA  
NEF(KFU) = ( 1.5377 +- 0.0497 ) + ( 0.04003 +- 0.00925)\*CSC L  
+ = LINEAR CONTRIBUTION

10.0db: NEF(KFU) = 1.768 +- 0.56 dB ( 13.7 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.96%	0.00	0.51	2.66	1.39	0.00	0.06	3.52	0.35	2.57	5.65	0.14	0.62%

#####  
G(dB) G-diff T(K) Tact) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.15 0.11 119.6 727.1 1.2506 1.81 % 0.147 dB 13.10% 13.11 K 174.0

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9248=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0269=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(KU)	N(K)
0.951	0.904	1.000	1.000	0.902	0.992	0.795	0.6461	0.98	598.4	2.300E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

20.0db: NEF(KFU) = 1.655 +- 0.45 dB ( 10.9 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.29%	0.00	0.48	1.41	1.47	0.00	0.06	3.72	0.37	2.67	2.99	0.04	0.65%

CALCULATED VIA G/T<sub>e</sub> fit and T<sub>e</sub>  
#####  
G(dB) G-diff T(K) Tact) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.05 0.01 106.6 727.1 1.2936 1.81 % 0.147 dB 13.10% 6.74 K 170.2

E.g. G calculated from HPBW is 61.06 dB  
2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9611=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0850=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(KU)	N(K)
0.975	0.904	1.000	1.000	0.965	0.990	0.848	0.6459	0.98	598.4	2.455E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

# REWORK (cont)

30.0deg: NEF(LFU) = 1.618 +- 0.40 dB ( 9.7 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.10%	0.00	0.45	0.93	1.42	0.00	0.06	3.61	0.36	2.58	1.97	0.02	0.63%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.02 -0.02 102.7 727.1 1.3089 1.81 % 0.147 dB 13.10% 4.63 K 169.0

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9732=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0521=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	X1(K)
0.983	0.904	1.000	1.000	0.976	0.999	0.866	0.6458	0.98	598.4	2.506E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

40.0deg: NEF(LFU) = 1.600 +- 0.38 dB ( 9.1 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.04%	0.00	0.43	0.72	1.41	0.00	0.06	3.57	0.36	2.55	1.51	0.01	0.62%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.01 -0.03 100.9 727.1 1.3165 1.81 % 0.147 dB 13.10% 3.61 K 168.4

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9791=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0411=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	X1(K)
0.986	0.904	1.000	1.000	0.981	0.999	0.875	0.6458	0.98	598.4	2.531E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

50.0deg: NEF(LFU) = 1.590 +- 0.37 dB ( 8.9 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.01%	0.00	0.43	0.60	1.40	0.00	0.06	3.55	0.36	2.53	1.26	0.01	0.62%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.00 -0.04 99.8 727.1 1.3209 1.81 % 0.147 dB 13.10% 3.03 K 168.1

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9824=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0358=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	X1(K)
0.989	0.904	1.000	1.000	0.984	1.000	0.879	0.6458	0.98	598.4	2.545E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####



# REWORK (cont)

TAPE 9 data 2 NBS10.41 REWORK 19848.0006 T4-F12,D1-F16 REWORK 15.01  
NBS1A.01 LOADER <9913.0003> T2-F0,D1-F0, X.04<0002>T2-4,D1-4

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RUN 3

PROG 376.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 (1976.930)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMID	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	43.0 %	4.5 mm/m <sup>3</sup>	74	0 mph

FIT TO 8 DATA  
NUF(kFU) = ( 1.5323 +- 0.0511 ) + ( 0.07731 +- 0.00951 ) \* CSC L  
+ = LINEAR CONTRIBUTION

10.0deg: NUF(kFU) = 1.578 +- 0.56 dB ( 13.7 %) 7.319 GHZ

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.94%	0.00	0.51	2.66	1.39	0.00	0.06	3.63	0.35	2.57	5.64	0.14	0.61%

#####  
G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.15 0.11 119.6 727.1 1.2506 1.01 % 0.151 dB 13.10% 13.11 K 174.0

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9348=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0245=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.951	0.904	1.000	1.000	0.932	0.992	0.795	0.6461	0.98	598.4	2.300E-05

SITE ELEV	oxy attn	water attn	zenith attn	REFR #1	REFR #2	ant-DIAM
0.107 km	0.03443 dB	0.0037 dB/dens	0.0381 dB	1.031	0.0130	60.0 ft

#####

20.0deg: NUF(kFU) = 1.758 +- 0.45 dB ( 10.9 %) 7.319 GHZ

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.26%	0.00	0.48	1.40	1.46	0.00	0.06	3.92	0.37	2.66	2.97	0.04	0.65%

#####  
G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.05 0.01 106.6 727.1 1.2936 1.01 % 0.151 dB 13.10% 6.74 K 170.2

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9611=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0796=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.975	0.904	1.000	1.000	0.965	0.993	0.848	0.6459	0.98	598.4	2.455E-05

SITE ELEV	oxy attn	water attn	zenith attn	REFR #1	REFR #2	ant-DIAM
0.107 km	0.03443 dB	0.0037 dB/dens	0.0381 dB	1.031	0.0130	60.0 ft

#####

# REWORK (cont)

30.0deg: HUF(FPU) = 1.687 +- 0.49 dB ( 9.7 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.09%	0.00	0.44	0.93	1.43	0.00	0.06	3.72	0.36	2.57	1.97	0.02	0.63%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAPER  
 61.02 -0.02 102.7 727.1 1.3089 1.81 % 0.151 dB 13.10% 4.63 K 169.0

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9732=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=H(21,3) 15=T(1,11) 1.0498=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (cont HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.983	0.904	1.000	1.000	0.976	0.999	0.866	0.6458	0.98	598.4	2.506E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

40.0deg: HUF(FPU) = 1.653 +- 0.38 dB ( 9.2 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.03%	0.00	0.43	0.72	1.41	0.00	0.06	3.68	0.36	2.54	1.51	0.01	0.62%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAPER  
 61.01 -0.03 100.9 727.1 1.3165 1.81 % 0.151 dB 13.10% 3.61 K 168.4

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9791=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=H(21,3) 15=T(1,11) 1.0399=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (cont HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.986	0.904	1.000	1.000	0.981	0.998	0.875	0.6458	0.96	598.4	2.531E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

50.0deg: HUF(FPU) = 1.630 +- 0.37 dB ( 8.9 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
6.00%	0.00	0.43	0.60	1.40	0.00	0.06	3.67	0.36	2.53	1.26	0.01	0.62%

#####  
 G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAPER  
 61.00 -0.04 99.8 727.1 1.3209 1.81 % 0.151 dB 13.10% 3.03 K 168.1

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9824=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=H(21,3) 15=T(1,11) 1.0348=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (cont HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.989	0.904	1.000	1.000	0.984	1.000	0.879	0.6458	0.98	598.4	2.545E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

# REWORK (cont)

TAPE 9 data 2 NBS10.41 REWORK 9848.0006 T4-F12-D1-F16 REWORK 15.01  
NBS1A.01 LOADER 9913.0000 T2-F0-D1-F0 X.04 0002 T2-4-D1-4

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RUN 3

PRG 276.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.920)  
7.319 GHz: 60.0 Ft DISH

TEMP	DEW Pt.	REL HUMID	WATER DENS	CLOUD COVER	WIND
53.0 F	30.3 F	43.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

FIT TO 8 DATA  
G/T(dB) = ( 41.1930 +- 0.1258 ) + ( -0.14234 +- 0.02341 ) \* CSC L  
+ = LINEAR CONTRIBUTION

10.0deg: G/T(dB) = 40.373 +- 0.54 dB ( 13.3 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.50	2.59	1.35	0.00	0.06	3.12	0.35	2.51	5.51	0.14	0.60%

#####  
G(dB) G-diff T(K) Ta(K) Y-tac HPBWerr data fit c(1-K2) bright effAPER  
61.15 0.11 119.6 727.1 1.2506 1.81 % 0.133 dB 13.10% 13.11 K 174.0

2.30=R2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9248=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.951	0.904	1.000	1.000	0.932	0.992	0.795	0.6461	0.98	598.4	2.300E-05

SITE ELEV oxy atn water atn zenith atn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

20.0deg: G/T(dB) = 40.373 +- 0.42 dB ( 10.1 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.44	1.30	1.35	0.00	0.06	3.12	0.35	2.46	2.75	0.04	0.60%

#####  
G(dB) G-diff T(K) Ta(K) Y-tac HPBWerr data fit c(1-K2) bright effAPER  
61.05 0.01 106.6 727.1 1.2936 1.81 % 0.133 dB 12.10% 6.74 K 170.2

2.30=R2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9611=J1+K8 for print source  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2+en enhancement  
\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.975	0.904	1.000	1.000	0.965	0.998	0.848	0.6459	0.98	598.4	2.455E-05

SITE ELEV oxy atn water atn zenith atn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

# REWORK (cont)

30.0deg: G/T(dB) = 40.902 +- 0.33 dB ( 9.1 %) 7.319 GHZ

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.42	0.89	1.35	0.00	0.06	3.12	0.35	2.45	1.87	0.02	0.60%

#####  
 G(dB) G-diff T(K) To(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.02 -0.02 102.7 727.1 1.3089 1.81 % 0.133 dB 13.10% 4.63 K 169.0

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9732=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.983	0.904	1.000	1.000	0.976	0.999	0.866	0.6458	0.98	598.4	2.506E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

40.0deg: G/T(dB) = 40.972 +- 0.36 dB ( 8.7 %) 7.319 GHZ

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.42	0.69	1.35	0.00	0.06	3.12	0.35	2.45	1.45	0.01	0.60%

#####  
 G(dB) G-diff T(K) To(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.01 -0.03 100.9 727.1 1.3165 1.81 % 0.133 dB 13.10% 3.61 K 168.4

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9791=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.986	0.904	1.000	1.000	0.981	0.999	0.875	0.6458	0.98	598.4	2.531E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####

50.0deg: G/T(dB) = 41.007 +- 0.35 dB ( 8.4 %) 7.319 GHZ

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.41	0.58	1.35	0.00	0.06	3.12	0.35	2.44	1.22	0.01	0.60%

#####  
 G(dB) G-diff T(K) To(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
 61.00 -0.04 99.8 727.1 1.3289 1.81 % 0.133 dB 13.10% 3.03 K 168.1

2.30=A2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9824=J1  
 0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.983	0.904	1.000	1.000	0.984	1.000	0.879	0.6458	0.98	598.4	2.545E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
 0.107 km 0.03443 dB 0.0037 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
 #####



# REWORK (cont)

TAPE 9 Data 2 NBS1D.41 REWORK 19848,00003 T4-F12,D1-F16 REWDPR 15.01  
NBS1A.01 LOADER 19913,00003 T2-F0,D1-F0, X.041000027T2-4,D1-4

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RUN 3

PROG 376.5407 FT. DETRICK ANT #1  
THU: 1976 DEC 2 ( 1976.939)  
7.319 GHz, 60.0 Ft DISH

TEMP	DEW PT.	REL HUMD	WATER DENS	CLOUD COVER	WIND
53.0 F	30.9 F	40.0 %	4.5 gm/m <sup>3</sup>	74	0 mph

FIT TO 8 DATA  
G/T(dB) = ( 32.3407 +- 0.1315) + ( 0.03342 +- 0.02446)\*OSC L  
+ = LINEAR CONTRIBUTION

10.0deg: G/T(dB) = 32.533 +- 0.55 dB ( 13.4 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.50	2.59	1.35	0.00	0.06	3.26	0.35	2.51	5.51	0.14	0.60%

#####  
G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.15 0.11 119.6 727.1 1.2506 1.81 % 0.139 dB 13.10% 13.11 K 174.0

2.30=R2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9248=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.951	0.904	1.000	1.000	0.992	0.992	0.795	0.6461	0.98	598.4	2.300E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB -0.0007 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

20.0deg: G/T(dB) = 32.438 +- 0.42 dB ( 10.2 %) 7.319 GHz

E-S	E-F	E-Y	E-K1	E-K2	E-K3	E-K4	E-K5	E-K6	E-K7	+E-K8	+E-K9	E-TA
5.80%	0.00	0.44	1.30	1.35	0.00	0.06	3.26	0.35	2.46	2.75	0.04	0.60%

#####  
G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) bright effAREA  
61.05 0.01 106.6 727.1 1.2936 1.81 % 0.139 dB 13.10% 6.74 K 170.2

2.30=R2 0.20=C9 0.1=D1 0.14345=N(21,1) 460=T(1, 9) 0.9611=J1  
0.75=D8 0.18=D9 0.1=C8 0.00260=N(21,3) 15=T(1,11) 1.0000=C2

\*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1	K2	K3	K6	K8	K9	K	APR-eff	R-eff	S(FU)	Xi(K)
0.975	0.904	1.000	1.000	0.955	0.998	0.848	0.6459	0.98	598.4	2.455E-05

SITE ELEV oxy attn water attn zenith attn REFR #1 REFR #2 ant-DIAM  
0.107 km 0.03443 dB -0.0007 dB/dens 0.0381 dB 1.031 0.0130 60.0 ft  
#####

# REWORK (cont)

```

30.0deg:          G/TRA(dB) = 21.460 +- 0.38 dB      ( 9.2 %)      7.319 GHz

E-S   E-F   E-Y   E-K1  E-K2  E-K3  E-K4  E-K5  E-K6  E-K7  +E-K8  +E-K9  E-TA
5.80%  0.00  0.42  0.89  1.35  0.00  0.06  3.26  0.35  2.45  1.87  0.02  0.60%

#####
G(dB)  G-diff  T(K)   Ta(K)   Y-fac  HPBWerr  data fit  c(1-K2) bright  effAREA
61.00  -0.03  102.7   727.1  1.5669  1.81 %  0.139 dB  13.10%  4.63 K  169.0

2.30=A2   0.20=C9   0.1=D1   0.14345=N(21,1)  460=T(1, 9)  0.9732=J1
0.75=D8   0.18=D9   0.1=C8   0.00260=N(21,3)  15=T(1,11)  1.0000=C2

*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1      K2      K3      K6      K8      K9      K      APR-eff  R-eff  S(FU)  X1(K)
0.983  0.904  1.000  1.000  0.976  0.999  0.866  0.6458  0.98  598.4  2.506E-05

SITE ELEV  oxy atn  water atn  zenith atn  REFR #1  REFR #2  ant-DIAM
0.107 km  0.03443 dB  0.0037 dB/dens  0.0381 dB  1.031  0.0130  60.0 ft
#####

40.0deg:          G/TRA(dB) = 32.393 +- 0.36 dB      ( 8.8 %)      7.319 GHz

E-S   E-F   E-Y   E-K1  E-K2  E-K3  E-K4  E-K5  E-K6  E-K7  +E-K8  +E-K9  E-TA
5.80%  0.00  0.42  0.69  1.35  0.00  0.06  3.26  0.35  2.45  1.45  0.01  0.60%

#####
G(dB)  G-diff  T(K)   Ta(K)   Y-fac  HPBWerr  data fit  c(1-K2) bright  effAREA
61.01  -0.03  100.9   727.1  1.3165  1.81 %  0.139 dB  13.10%  3.61 K  168.4

2.30=A2   0.20=C9   0.1=D1   0.14345=N(21,1)  460=T(1, 9)  0.9791=J1
0.75=D8   0.18=D9   0.1=C8   0.00260=N(21,3)  15=T(1,11)  1.0000=C2

*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1      K2      K3      K6      K8      K9      K      APR-eff  R-eff  S(FU)  X1(K)
0.986  0.904  1.000  1.000  0.981  0.999  0.875  0.6458  0.98  598.4  2.531E-05

SITE ELEV  oxy atn  water atn  zenith atn  REFR #1  REFR #2  ant-DIAM
0.107 km  0.03443 dB  0.0037 dB/dens  0.0381 dB  1.031  0.0130  60.0 ft
#####

50.0deg:          G/TRA(dB) = 32.384 +- 0.35 dB      ( 8.5 %)      7.319 GHz

E-S   E-F   E-Y   E-K1  E-K2  E-K3  E-K4  E-K5  E-K6  E-K7  +E-K8  +E-K9  E-TA
5.80%  0.00  0.41  0.58  1.35  0.00  0.06  3.26  0.35  2.44  1.22  0.01  0.60%

#####
G(dB)  G-diff  T(K)   Ta(K)   Y-fac  HPBWerr  data fit  c(1-K2) bright  effAREA
61.00  -0.04  99.8    727.1  1.3209  1.81 %  0.139 dB  13.10%  3.03 K  168.1

2.30=A2   0.20=C9   0.1=D1   0.14345=N(21,1)  460=T(1, 9)  0.9824=J1
0.75=D8   0.18=D9   0.1=C8   0.00200=N(21,3)  15=T(1,11)  1.0000=C2

*HPBW #1 = 0.14276 +-0.000006 CSC L = 0.1427 (ant HPBW = 0.1419)

K1      K2      K3      K6      K8      K9      K      APR-eff  R-eff  S(FU)  X1(K)
0.989  0.904  1.000  1.000  0.984  1.000  0.879  0.6458  0.98  598.4  2.545E-05

SITE ELEV  oxy atn  water atn  zenith atn  REFR #1  REFR #2  ant-DIAM
0.107 km  0.03443 dB  0.0037 dB/dens  0.0381 dB  1.031  0.0130  60.0 ft
#####

```



#### 6.5.9 Documentation of Final Results

The last step in the measurement procedure is to enter the results from the last data rework into the SITE PREP program, which lists all the program assumptions and measurement errors in a more explicit form. To better understand this procedure, an annotated printout of the important entrees is given in the following paragraph. For this illustration, the final rework is assumed to be the one used in the annotated printout for the third level rework in the immediately preceding section. The information used from this rework is encircled on the G/T error table printout, and corresponding use of this information is encircled in the data entry portion on the following annotation. The SITE PREP error table printout contains the same information as the REWORK error table printout. To facilitate the comparison, some of the information on the following SITE PREP printout has the corresponding REWORK table printed next to it.

# FINAL RESULTS

CHANGE RUN DATE/SITE:1=YES(=NO): 0 01  
 RUN NUMBER(=NO): 0  
 YEAR(=NO)NOW: 1976  
 MONTH(=NO)NOW: DEC  
 DAY OF MONTH(=NO)NOW: 12  
 DAY OF WEEK(=NO)NOW: THUR  
 PROJ #(=NO)NOW: 276,54077  
 LOCATION(=NO)NOW: PT. BAY  
 SITE:W. LONG(=NO): 122.05  
 SITE:N.LAT(=NO): 37.1  
 SITE:ALT(KM)(=NO): 0.10

NEW F.BW/ELEV/ANT CONT:1=NO 01  
 CENTER FREQ(GHZ)(=NO): 1  
 EPR IN FREQ(K)(=NO): 0.01  
 BANDWIDTH(MHZ)(=NO): 5.5  
 ELEV(DEG)(=NO): 24  
 ANT DIAM (FT)(=NO): 60

1=APR EFF,2=ANT HPBW,3=CHVL HPBW 0 02  
 ANT HPBW(DEG)(=NO): 0.14100000 0.1419  
 HPBW ERR:15,1(=NO): 1.01  
 ANT PT ERR:1=DEG,2=HPBW(=NO): 0  
 DEG(=NO): 0.015 2

ANT PT ERR corresponds to G-T data fit (3\*15/SQR(#PTS) of 0.126787507 dB

0.126787507 DB:0=TRY AGAIN(=NO): 1 00  
 DEG(=NO): 0.015 2.015

ANT PT ERR corresponds to G-T data fit (3\*15/SQR(#PTS) of 0.136957186 dB

0.136957186 DB:0=TRY AGAIN(=NO): 1 00  
 DEG(=NO): 0.015 2.0158

ANT PT ERR corresponds to G-T data fit (3\*15/SQR(#PTS) of 0.133648859 dB

0.133648859 DB:0=TRY AGAIN(=NO): 1 00  
 DEG(=NO): 0.0158 2.01576

ANT PT ERR corresponds to G-T data fit (3\*15/SQR(#PTS) of 0.132991632 dB

0.132991632 DB:0=TRY AGAIN(=NO): 1 0

CHANGE:1=T(K); 2=G/T(=NO): 0

G/T(DB/K)(=NO): 48.1 00 00

CHANGE:1=G/T(=NO): 0

ADDED NOISE (K)(=NO):

AMBIENT TEMP(F)(=NO):

DEM PT TEMP(F)(=NO):

ENTER SUN/MOON ALMIND: 1 YES(=NO): 0 00

PRT SITE/STAR DATA(0=NO,1=NO): 1 20

# FINAL RESULTS (cont)

NS812.07 SITE PREF DI FFL 10-51 1.00 10-4 12-4

SPEC = 5.07

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PRNG 100 1000 1000 DETAIL 1000 1000  
THUS 1000 1000 1000 1000 1000  
7.31 1000 1000 1000 1000

G 7  
32.43 dB

TYPICAL RESULTS FOR 100 MEASUREMENT (size 100)

*differs from NETWORK value because of G value*  
G 61.04 dB  
T 106.2 K  
APR-eff 0.0-0.0  
R-eff 0.0  
ANT 0.1-1.0 dB  
HPBW 0.1418 dB  
effAREA  
G(28) - G-eff  
Antenna Elev = 20.0 deg

PARAMETER	ERR TO 100
F FREQUENCY (GHz)	7.319 +- 0.01 %
S FLUX (FLO=100(-26)W) S(FU) 198.4 +- 5.00 %	+- 0.00 % E-F +- 5.00 % E-S
T TANT = 31.2 K X1 = 2.458E-05 K <sub>i</sub> (k)	
Y Y-FACTOR Y(GB) = 1.119 GB Y-fac 1.119 +- 0.10 % C8	+- 0.44 % E-Y
K1 ATM ABSORPTION FACTOR K1 1.375 +- 1.00 % oxygen atten = 0.0044 dB oxy atten water atten = 0.0037 dB water atten water dens = 4.5 g/cm <sup>3</sup> atm bright = 5.7 % bright site alt = 0.1 amb temp = 0.0 dew D8 = 0.0	+- 1.30 % E-K1
K8 DIFFUSION K8 1.065 +- 0.75 %	+- 2.75 % E-K8
K9 REFRACT D9 = 0.13(1.0-1) K9 0.998 +- 0.04 %	+- 0.04 % E-K9
K2 STAP C(1-K2) 100.0 DI K2 0.985 +- 1.34 %	+- 1.34 % E-K2
K3 ENDING EFFECTS K3 1.000 +- 0.00 % bandwidth = 5.5 MHz	+- 0.00 % E-K3
K4 DIFF SYSTEM TEMP 1.000 +- 0.00 %	+- 0.00 % E-K4
K5 ANT POINT(+- 0.015) 1.000 +- 0.11 % or C-T data fit = 0.0 data fit	+- 0.11 % E-K5
K6 ANT POLARIZATION FAC K6 1.000 +- 0.00 %	+- 0.00 % E-K6
K7 SYSTEM RESPONSE FAC K7 1.000 +- 2.46 % instr amp resp (+- 0.20%) C9 Y/(Y-1) = 4.402	+- 2.46 % E-K7
Ta ADDED NOISE A2 Ta(K) 1.1 +- 0.00 %	+- 0.00 % E-TA
TOTAL ERROR: quad sum + diffus + refr err	

## 7. COMPUTER PROGRAM CONSTANTS

The meanings of the computer program constants are listed in this section. Some of the program constants are used more than once so that the appropriate meaning must be deduced from the context of the program. For convenience, the simple program variables are listed first, the matrix variables listed next, and the defined functions, key functions, flags, and multiplex functions (FNX functions) are listed last. Each of the lists are printed twice, once in alphabetical order by the variable name, and once in alphabetical order by meaning. The use of these definition lists with the use of the cross reference lists included at the end of the program listings makes it possible to rapidly locate a specific calculation within a program.

As a courtesy, the program and file tapes to generate these lists have been included in the software library of the ETMS. To use the program, tape 6 is inserted into the cassette unit, LOAD 10, then RUN. Then the appropriate tape needs to be inserted into the cassette unit (tape 6 for the variables list, tape 7 for the matrix list, or tape 8 for the function, key, flag list). The computer generated messages will guide one through the required steps. To print out a program constants listing, at the TRAP select 5 = LIST. For the question PRT: X,A,B,C,D ( $\emptyset$  = NO, 1 = YES, 9 = ALL), 5 keyboard entries are required before the sort and list are initiated.

## 7.1 VARIABLES LIST ALPHABETICAL BY VARIABLE

NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

1	A	AZIMUTH(deg) OR DUMMY
2	A\$,B\$	DUMMY
3	A(N7)	SET DATA: SLE MATRIX LIST
4	A0	REWORK #
5	A1	FILTER #
6	A2	GAUSS CURVE FIT ERROR,% dT
7	A3	ATTENUATION OF STD ATTN (abs>1 , NOT dB),RELATED TO N(13,10)
8	A4,A5,A6	SYST CONSTS:PRGM USES N(1,4),N(1,5),N(1,6)
9	A6	RATIO #1 add/#2 add uses N(18,5 or 10)
10	B	HPBW#1(min of arc),AS MEASURED-NO KANDA CORRECTION
11	B(I,J)	DUMMY MATRIX
12	B0	HPBW(minutes) with Kanda correction
13	E1	DECL OFFSET (deg)
14	E1	CODE FOR SATELLITE CARRIER MEAS:0=SKY,1=-F,2=RCR @ F,3=+F,4=OTHER
15	B2,B3	ANTENNA APERTURE EFFICIENCY, ANT RADIATION EFFICIENCY
16	B4	ATMOSPHERIC BRIGHTNESS TEMPERATURE, K
17	B5	TEMPERATURE(F)
18	B5	T/TA ZENITH
19	B6	DLW POINT(F)
20	B6	T/TA CSC COEFF
21	B7,B8	G/Ta(dB) ZENITH COEFF,CSC COEFF
22	B8	P(ONT),FW=(F5+F8)/2: in C/KT MEAS
23	B9	ANTENNA EFFECTIVE AREA
24	C	DATE, DECIMAL
25	C(I,J)	G(I,J) INVERSE OR DUMMY
26	C0	SITE ELEV (Km)
27	C1	$C^2/(8*PI*K*F^2)$
28	C1	SPACE LOSS
29	C2	ERROR enhancement factor for NEF,NUF compared to G/T
30	C2	FLAT-5dB ATTN IN NOISE ADD PWR MEAS:0=NO,1=YES
31	C3	FLAG-NOISE ADD: 0=#1&#2,1=#1,2=#2
32	C4,C5	SITE: W.LONG (deg), N. LAT (deg)
33	C6	GHA TO ARIES @ 0 GMT (hrs)
34	C7	G via HPBW - G via G/Ta, dB
35	C8	Y-FACTOR ERR,%
36	C8	FILTER FREQ (MHz)
37	C9	INSTRUMENTAL POWER RESPONSE ERR,%
38	C9	FILTER BANDPASS (MHz)
39	D	ANTENNA DIAMETER(FT)
40	D5	REMARKS
41	L(T6,I)	DATA MATRIX: SEE MATRIX LIST
42	D0	SKY BACKGROUND ERR, $0.9/F^2$

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

43	D1	STAR SHAPE ERR,%
44	D2	HPBW UNCERTAINTY,%
45	E3	ADDED NOISE ERROR,%
46	E5	ANTENNA POINTING ERROR (deg)
47	E8	DIFFUSIVE ATTENUATION ERR,%
48	D9	REFRACTIVE ATTENUATION ERROR,%
49	E	HOOR ANGLE(deg)
50	E	EIRP*G/Ta
51	E	DAYS SINCE 1900.00
52	E0	G/T LRR-FREQ
53	E0	ATTENUATION(dB) OF PROGRAM ATTENUATOR, TEMPORARY VALUE
54	E1	TIME OF STAR PEAK (hrs)
55	L1	YEAR
56	E1	G/T ERR-ATMOSPHERIC ABSORPTION
57	E1	EIRP:PWR no noise add (mW)
58	E2	ATTENUATION(dB) OF PROGRAM ATTENUATOR
59	E2	G/T LRR-STAR SHAPE
60	E2,E3	MONTH, DAY
61	L3	G/T EIR-BANDWIDTH
62	L3	TIME DELAY TO SET ANTENNA (SEC)
63	E3	EIRP:PWR+noise add #1 (mW)
64	L4	G/T EIR-DIFFERENTIAL SKY TEMP
65	L4	TRANSMITTER POWER, WATTS
66	L4	EIRP:PWR+noise add #2 (mW)
67	E5	TIME/MEASUREMENT (hrs)
68	E5	G/T ERR-ANTENNA POINTING
69	E5	YEARS (JULIAN) SINCE 1900 /4
70	E5	EIRP:PWR+noise add #1 & #2 (mW)
71	E6	YEARS SINCE 1977
72	E6	G/T ERR-ANT POLARIZATION
73	E6	ATTENUATION(dB), MANUAL ATTENUATOR
74	E6	MEASUREMENT # OF FIT GAUSSIAN CURVE TO DRIFT CURVE
75	E7	G/T ERR-SYSTEM RESPONSE
76	E7	STANT RANGE,10^6 Km
77	E7	HPBW FIT BY GAUSSIAN CURVE TO DRIFT CURVE
78	E8	TIME(hrs)/(ARC deg)
79	E8	G/T ERR-ATMOSPHERIC DIFFUSION
80	E9	GHA TO ARIES(deg)



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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

81	E9	G/T ERR-ATMOSPHERIC REFRACTION
82	E9	PWR(RW) ON SAT SIGNAL
83	F	FREQ OF MEASUREMENT(GHz)
84	F	RECEIVER FREQ(GHz)
85	F(I)	DUMMY MATRIX
86	F0	FREQ LPR, #
87	F0	VALUE OF C2 IN FNN
88	F1	FLAG: 0=STAR,1=SATELLITE
89	F1	SPACE LOSS: in C/KT MEAS
90	F1	FLAG-GRAPH:0=NO,1=DATA,2=&FIT,3=FIT,4=EXIT
91	F1	FLAG: 1=SUBROUTINE LOADED
92	F1	FLAG:0=RT PWR & VOLTS, 2=GRAPH PWR RATIO (in E)
93	F2	FLAG-PFT:0=ALL,1=PROG DATA,2=INPUT ASSUMPS,3=G/T ERR,4=ANT ELEV vs GMT
94	F2	P/Pa for LOWER FREQ CNT: in C/KT meas
95	F2	FLAG: 0=NORMAL,1=DIFF PLOT DATA,2=DIFF PLOT OF 5 CUTS
96	F2	FLAG:0=CSC fit, 1=LINEAR fit
97	F2	FLAG:0=NO AUTO CHECK,1=YES (in E)
98	F3	FLAG: 0=MANUAL READ TEMP,HUMIDITY, 1=AUTO TEMP,DEW PT
99	F3	FLAG-SORT & FIT:1=G/T-ELEV,2=G/T-CSC,3=DIP-ELEV,4=DIP-TIME
100	F3	FREQ(GHz) SELECTED FOR REWORK, 0=REWORK ALL FREQ
101	F3	FLAG:0=XTAL,1=TYPE IV bridge (in E)
102	F4	FLAG IN D:1=SIMULATED NOISE ADD,2=EARHT TERMINAL
103	F4	FILE LOAD #
104	F4	FILE # OF M7=1, STARTING M(40,1)
105	F5	FLAG IN D:1=PRGM REWORK
106	F5	FLAG IN D:1=NOISE ADD #1 WORKS
107	F5	P(ONT) @ -F: in C/KT meas
108	F5	FLAG-PROGR REWORK PATTERN:0=NO
109	F5	FLAG: 0,1= volt table in LINEARITY ck, 2,3=stability GRAPH (in E)
110	F6	FLAG TASK:1=NEW SITE,2=MEAS,3=REWORK,0=MANL VIA KEYBOARD
111	F6	FLAG-AUTO SEQUENCE:1=YES
112	F6	FLAG:0=RESTART,1=SKY,2=G/T,3=EIRP,4=LINK
113	F6	FLAG IN E:0=PRGM ATTN,1=STD ATTN
114	F6	FLAG IN E:1=NOISE ADD #2 WORKS
115	F7	FLAG: 0=CASSETTE BEING USED,1=DISK
116	F7	FLAG-PWR LEVEL: 0=CONST, 1=STEPPED (in E)
117	F8	FLG in E:(KEY 5)0=GRAPH,1=LIST,(KEY 6)0=SIML NOISE ADD,1=EARTH TERM
118	F8	P(ONT) @ +F: in C/KT meas

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

119	F8	FLAG IN D:1=NO FIT CUTS
120	F9	STORE SET # OF SUMMARY OF REWORK DATA
121	F9	ATTN VALUE OF LAST PROG ATTN IN FNW
122	F9	T(sky)/Ta: in C/KT meas
123	C	ANTENNA GAIN,REL
124	G(I,J)	CURVE FIT MATRIX
125	G4	OXYGEN ABSORPTION (dB/Km)
126	G5	WATER ABSORPTION,#1 CONST (dB/Km)
127	G6	WATER ABSORPTION, #2 CONST (dB/Km)
128	H	HOUR ANGLE OFFSET (deg)
129	H	SIMULATED STAR NOISE(dB)
130	H5	MAIN PROGRAM HEADING
131	H1	FIT TO G/T or NLF data (3*1S/SQR(#PTS)),dB
132	H5	INSTR PWR RESPONSE FACTOR
133	H9	ADDED NOISE,K
134	1	LOOP VARIABLE
135	1	HPBW
136	15	PLOT UNIT
137	J	BRDC PWR when NOISE ADD sources ON
138	J	MAXIMUM FLUX IN F.U.
139	J	SELECT FUNTION:19=G/T,20=G/TA,21=HPEW#1,22=#2,24=DECU,25=NEF,26=NUF
140	J1	K8 for POINT SOURCE
141	J1	LOOP VARIABLE
142	K	K1*K2*...*K9
143	K1	ATMOSPHERIC ABSORPTION TRANSMISSION COEFF
144	K2	STAR SHAPE FACTOR
145	K3	BANDWIDTHS EFFECTS FACTOR
146	K4	DIFFERENTIAL SKY TEMPERATURE FACTOR
147	K5	ANTENNA POINTING FACTOR
148	K6	ANTENNA POLARIZATION FACTOR
149	K7	SYSTEM RESPONSE FACTOR
150	K8	DIFFUSIVE ATTENUATION FACTOR
151	K9	REFRACTIVE ATTENUATION FACTOR
152	L	ELEVATION(deg)
153	L5	FREQ,DIAM,G/T HEADING
154	L0	ELEVATION--NO REFRACTION CORRECTION
155	L0	FLAG IN D:0=GRAPH,1=ERR PRT OUT-no VARIABLES,2=with variables
156	L1	ELEVATION REFRACTION CORRECTION,deg

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

157	L1	ELEVATION FOR FITTING G/T OR G
158	L4	EFFECTIVE OXYGEN LENGTH, Km
159	L5	WATER PATH LENGTH CONST#1
160	L6	WATER PATH LENGTH CONST#2, Km
161	L7	WATER DENSITY (gm/m <sup>3</sup> )
162	L8	REFRACTION CONST #1
163	L9	REFRACTION CONST #2
164	M	G/T RELATIVE
165	M(N7,J)	SUMMARY DATA: SEE MATRIX LIST
166	M1	LOOP VARIABLE
167	M1	SUM ON P
168	M1...M4	ATTN OF PGM 1,2,4,8 @ 30 MHZ,PGM USES N(13,1...4)
169	M2	SUM ON X
170	M3	SUM ON Y
171	M3	MEASUREMENT # @ MAXIMUM AMPLITUDE
172	M6...M9	ATTN OF PGM 1,2,4,8 @ 70 MHZ, pgm uses N(13,6...9)
173	N	DATE, DECIMAL FOR MOON DATA
174	N	MEASUREMENT NUMBER
175	N(I,J)	INPUT DATA CONST, SLE MATRIX LIST
176	N0	STAR NUMBER, CURRENT
177	N1	NO. OF STAR SOURCES
178	N2	CUT NUMBER
179	N3	FWR MEASUREMENT # WITHIN A CUT
180	N4	LARGEST N3
181	N5	PAGE NUMBER
182	N6	RUN #
183	N7	SET #
184	N8	SUMMARY DATA # = M(50,1) = N7+F4
185	N9	NUMBER POINTS IN FIT
186	O1,O2,O3	FILTER#1 (2.5MHz @ 30MHz) CONSTS:N(15,1),N(15,2),N(15,3)
187	O6,O7,O8	FILTER#2 (1MHz @ 70MHz) CONSTS:N(15,6),N(15,7),N(15,8)
188	P	POWER MEASURED,MILLIWATTS
189	P\$	PROJECT HEADING
190	P1	STAR SHAPE ERROR,%
191	P1	RECEIVER GAIN SLOPE/mHz
192	P1,P2,P3	FILTER#3 (2.5MHz @ 70MHz) CONSTS:N(16,1),N(16,2),N(16,3)
193	P6,P7,P8	FILTER#4 (5.3MHz @ 70MHz) CONSTS:N(16,6),N(16,7),N(16,8)
194	Q,Q0,Q1	DUMMY

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

195	Q2,Q3	DUMMY
196	Q3	HPBW,ANTENNA ALONE(i.e. with KANDA CORRECTION)
197	Q3	POWER WITH NOISE ADD ON
198	Q3	FLG:(LOC SITE DATA).(F6=TASK)(F4=PRM CHANGE?)(F7=DISK)
199	Q5,Q6	dP(added) in C/kT meas: @ -F, @ +F
200	R	REMARKS: SEE REMARK LIST
201	R0	RATIO #1add/#2add @ 70 MHz, pgm uses N(18,10)
202	R1	ΔLRO FOR GRAPH
203	R2	RESIDUALS FROM CURVE FIT
204	R5	NUMBER OF POINTS FIT TO PARABOLA
205	S	G/T ERR-FLUX
206	S	TIME(hrs), CURRENT
207	S\$	STAR NAME
208	S(1,J)	STAR DATA: SEE MATRIX LIST
209	S3	PREDICTED MEASUREMENT # FOR MAXIMUM STAR PWR
210	T	T(syst)
211	T(N0,J)	INPUT STAR DATA: SEE MATRIX LIST
212	T1	TIME OF 1st MEASUREMENT
213	T1	G/T OR G/TA VALUE
214	T2	CURRENT MEASUREMENT TIME
215	T2	RUN/SET
216	T6	$N-6*(N7-1)$
217	U	POWER NORMALIZATION
218	V	VOLTAGE ACROSS PWR BRIDGE
219	V	-ALPHA, GAUSSIAN COEFF
220	V1	SUM ON $X^4$
221	V2	SUM ON $X^2$
222	V3	SUM ON $X^3$
223	V4	SUM ON $P*X^2$
224	V5	SUM ON $P*X$
225	V5	PARABOLIC FIT PARAMETER h
226	V6	$Tstar/TA=EXP(X-F(2)*W1^2)$
227	V6	SUM ON $P^2$
228	V7	dT(star)/TA
229	V7	DV,#1 RF OFF
230	V7	N3 OF STAR MAX
231	V8	DV, RF ON
232	V8	DISK OR TAPE #

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

233	V9	DV, #2 RF OFF
234	V9	dT(STAR)/TA PREDICTED
235	~	GAMMA, PARABOLIC FIT
236	W1	VARIANCE OF P(STAR)/P(ADD)
237	X	TIME VARIABLE, $2 \cdot I / N4 - 1$
238	X5	SUBROUTINE HEADING
239	X1	$\lambda_i = G/dT(star)$
240	X1	LOOP VARIABLE
241	X1	TIME VARIABLE, $2 \cdot (N3 - M3) / N4$
242	X2	GAMMA, PARABOLIC FIT
243	X2	VARIABLE IN FNG(N3)
244	X4	$K \cdot S / 2 / k$
245	X5	AZUMUTH BIAS (deg)
246	X6	ELEVATION BIAS (deg)
247	Y	Y-FACTOR
248	Y(I)	MATRIX USED IN CURVE FIT OR DUMMY
249	Y1	G/T ERR-Y factor ( $C8 \cdot Y5$ )
250	Y5	$Y / (Y - 1)$
251	Z	COLD SKY POWER / TA
252	Z1	ZENITH ATM ATTN, dB
253	Z3	SERVO VARIABLE
254	Z5	$C / kT \text{ MEAS: } T(ONT) / T_a \text{ FOR UPPER FREQ}$

## 7.2 MATRIX LIST ALPHABETICAL BY VARIABLE

NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

1	A( 1)	RUN/SET = 100*N6+N7: N6=RUN#, N7=SET#
2	A( 2)	FREQ(MHz)
3	A( 3)	AMBIENT TEMP(F) *10
4	A( 4)	DEW PT(F) *10
5	A( 5)	RELATIVE HUMIDITY(%) *10
6	A( 6)	CLOUD COVER * 100 + WIND(mph)
7	A( 7)*	PWR LEVEL, microwatts
8	A( 7)x	CODE(E1):0=SKY, 1=-F, 2=RCR @ F, 3=+F, 4=OTHER
9	A( 8)	PWR RATIO CHECK: microbells/10
10	A( 8)rw	T/Ta*10 <sup>4</sup>
11	A( 9)*	U*10 <sup>4</sup> : REFERENCE PWR
12	A( 9)x	NOT USED
13	A(10)*	HPBW#1*10 <sup>4</sup>
14	A(10)x	SLANT DIST(Km): LGT(E7)*1000
15	D( 1, 1)x	AZIMUTH: (AZ(deg)-180)*100
16	D( 1, 2)x	ELEV(deg)*100
17	D( 2, 1)x	FLAG C2: 0=NO STD ATTN WHEN NOISE ADD ON, 1=STD ATTN WHEN ...
18	D( 2, 2)x	MANUAL ATTN SETTING, dB (E6)
19	D( 3, 1)x	NUMBER OF MEAS(N4)
20	D( 3, 2)x	FILTER BANDWIDTH, MHz (W)*10
21	D( 4, 1)x	P/Padd(ave of set): LGT(P/Padd)10 <sup>4</sup>
22	D( 4, 2)x	TRX PWR: LGT(E4)*10 <sup>4</sup>
23	D( 5, 1)x	PWR#1, mw(ave, noise add OFF): LGT(PWR)*10 <sup>4</sup> ((E2+E6)/10)*10 <sup>4</sup>
24	D( 5, 2)x	GAIN SLOPE OF RCR (P1) * 1000
25	D( 6, 1)x	PWR due to NOISE ADD, mw: LGT(PWR#2-PWR#1)*10 <sup>4</sup>
26	D(1,N3+2)x	PWR WITH noise add OFF @ BOLO: LGT(PWR)*10 <sup>4</sup>
27	D(2,N3+2)x	PWR(noise add ON): LGT(BOLO PWR)*10 <sup>4</sup>
28	D(3,N3+2)x	PWR/Padd: LGT(P/Padd)*10 <sup>4</sup>
29	D(4,N3+2)x	TIME, hrs(E1)*10 <sup>3</sup>
30	D(5,N3+2)x	LGT(PWR METER VOLTAGE)*10 <sup>4</sup>
31	D(6,N3+2)x	ATTN, TOTAL: E2+E6
32	D(T6, 1)*	AZIMUTH: (AZ(deg)-180)*100
33	D(T6, 2)*	ELEVATION(deg)*100
34	D(T6, 3)*	# OF MEAS(N4)
35	D(T6, 4)*	TIME OF PREDICTED STAR MAX: E1*1000
36	D(T6, 5)*	DECL OFFSET FROM PREDICTED STAR CENTER: (B1+L1)deg *1000
37	D(T6, 6)*	LOG(((Tstar+Tsystem)/Tadd)/U)*10 <sup>4</sup>
38	D(T6, 6)rw	LGT(CT/Tadd)*10 <sup>4</sup>
39	D(T6, 7)*	FIT MEAS # AT PEAK * 100
40	D(T6,N3+7)	LOG(P/U)*10 <sup>4</sup> : P=PWR MEAS mw, U=PWR REF
41	M(40, 1)	NUMBER OF SUMMARY SETS STORED IN MATRIX M
42	M(40, 3)	NUMBER OF FILES USED IN DISK STORAGE



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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

```

43  M(N8, 1)      LLEV(deg) + STAR#/100
44  M(N8, 1) d    STAR #/100

45  M(N8, 1) x    CODE + .07
46  M(N8, 2) *    G/T (dB)
47  M(N8, 2) d    T/Ta ZENITH (b5)

48  M(N8, 2) x    PWR/Pa
49  M(N8, 3) *    G/TA (dB)
50  M(N8, 3) d    T/Ta CSC COEFF (B6)

51  M(N8, 3) x    PWR(mW)
52  M(N8, 4) *    HPLW#1 (deg)
53  M(N8, 4) d    TIME, DECIMAL HRS (FNT2)

54  M(N8, 4) x    PWR due to Ta (mW)
55  M(N8, 5) *    HPLW#2 (deg)
56  M(N8, 5) d    TEMPERATURE, F (A(3)/10)

57  M(N8, 5) x    C/KT (dB)
58  M(N8, 6)      FREQ (GHz)
59  M(N8, 7) *    Y-factor

60  M(N8, 7) d    WATER DENSITY (L7)
61  M(N8, 7) x    EIRP (dBw)+G/TA (dB) = E
62  M(N8, 8) *    DEF (KFU)

63  M(N8, 8) d    NUMBER OF POINTS IN DIP CURVE
64  M(N8, 8) x    CNT/Tadd: (F2+Z5)/2
65  M(N8, 9) *    NUF (KFU)

66  M(N8, 9) x    Pacd(Mw): (F5+F8)/2
67  M(N8, 10)     RUN/SET: N6+N7/100
68  N( 1, 4)      SYSTEM # + (DATA REVISION #/100)

69  N( 1, 5)      DAC REF volt: #3=6.313, #4=6.367, #5=6.284, #6=6.24
70  N( 1, 6)      DAC mult=-(chnl#9-#8)/#7: #3=0.3173, #4=0.32, #5=0.3187, #6=0.32
71  N( 1, 7)      ATTN+meter (dB/10) 5.3@70: #3=16.15, #4=17.3, #5=15.27, #6=-17.55

72  N( 1, 8)      RATIO #1 add/#2 add @ MICROWAVE FREQ
73  N( 1, 9)      NUMBER OF POINTS IN FIT
74  N( 1, 10)     REWORK #

75  N( 9&10, 1)   STORE STRING P$
76  N(13, 1)      ATTN of 1dB prgm @ 30MHz: #3=0.961
77  N(13, 2)      ATTN of 2dB prgm @ 30MHz: #3=1.881

78  N(13, 3)      ATTN of 4dB prgm @ 30MHz: #3=3.947
79  N(13, 4)      ATTN of 8dB prgm @ 30MHz: #3=7.881
80  N(13, 5)      ATTN of STD RES 30MHz: #3=5.922, #6=4.779

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

81	N(13, 6)	ATTN OF 1dB prgm @ 70:#3=0.976,#4=0.947,#5=0.938,#6=0.973
82	N(13, 7)	ATTN OF 2dB PRGM @70:#3=1.890,#4=1.95,#5=1.854,#6=1.957
83	N(13, 8)	ATTN of 4dB prgm @ 70:#3=3.909,#4=3.87,#5=3.957,#6=3.924
84	N(13, 9)	ATTN of 8dB PRGM @ 70:#3=7.896,#4=7.86,#5=7.845,#6=7.949
85	N(13,10)	ATTN of STD @ 70:#3=5.966,#4=5.92,#5=6.11,#6=6.1
86	N(15, 1)	FILT#1(2.5@30) NOISE BW:#3=3.915,#4=3.887,#5=3.643,#6=3.552
87	N(15, 2)	FILT#1(2.5@30)N1,MHz:#3=0.00938,#4=0.01526,#5=0.0178
88	N(15, 3)	FILTER#1(2.5MHz @ 30MHz):2nd CONST
89	N(15, 4)	FILT#1(2.5@30) LOSS,dB:#3=3.092,#4=2.711,#5=2.391,#6=2.560
90	N(15, 6)	FILT#2(1@70)NOISE BW:#3=1.193,#4=1.225,#5=1.23,#6=1.250
91	N(15, 7)	FILT#2(1@70)N1,MHz:#3=-0.1043,#4=0.0817,#5=0.1271
92	N(15, 8)	FILTER#2(1MHz @ 70MHz):2nd CONST
93	N(15, 9)	FILT#2(1@70)LOSS,dB:#3=4.970,#4=4.910,#5=4.870,#6=5.634
94	N(16, 1)	FILT#3(2.5@70)NOISE BW:#3=2.808,#4=2.910,#5=2.937,#6=2.875
95	N(16, 2)	FILT#3(2.5@70)N1,MHz:#3=-0.102,#4=0.0108,#5=-0.130
96	N(16, 3)	FILTER#3(2.5MHz @ 70MHz):2nd CONST
97	N(16, 4)	FILT#3(2.5@70) LOSS,dB:#4=5.78,#5=5.84,#6=5.814
98	N(16, 6)	FILT#4(5.3@70)NOISE BW:#3=5.734,#4=5.80,#5=5.856,#6=5.671
99	N(16, 7)	FILT#4(5.3@70)N1,MHz:#3=-0.14,#4=-0.0782,#5=0.011
100	N(16, 8)	FILTER#4(5.3MHz @ 70MHz):2nd CONST
101	N(16, 9)	LOSS,dB:#4=4.18,#5=3.14,#6=4.083
102	N(17, 6)	FILT#6(0.06@70MHz)NOISE BW,MHz:#6=0.083
103	N(17, 7)	FILT#6(0.06@70MHz)N1,MHz:#6=0.00178
104	N(17, 9)	FILT#6(0.06@70MHz)INER LOSS,dB:#6=4.719
105	N(18, 5)	RATIO #1 add/#2 add @ 30MHz
106	N(18,10)	RATIO #1add/#2add @ 70:#4=0.515,#5=0.526,#6=0.2468
107	N(19, 1)	G/T(dB) INTERCEPT
108	N(19, 2)	G/T(dB) ZENITH
109	N(19, 3)	G/T(dB) INTERCEPT 1S ERR
110	N(19, 4)	G/T(dB) ZENITH 1S ERR
111	N(19, 5)	G/T(dB) ELEV COEFF
112	N(19, 6)	G/T(dB) CSC COEFF
113	N(19, 7)	G/T(dB) ELEV COEFF ERR
114	N(19, 8)	G/T(dB) CSC COEFF ERR
115	N(20, 1)	G/TA(dB) INTERCEPT
116	N(20, 2)	G/TA(dB) ZENITH
117	N(20, 3)	G/TA(dB) INTERCEPT 1S ERR
118	N(20, 4)	G/TA ZENITH 1S ERR

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

119	N(20, 5)	G/TA(GB) ELEV COEFF
120	N(20, 6)	G/TA(GB) CSC COEFF
121	N(20, 7)	G/TA(GB) ELEV COEFF ERR
122	N(20, 8)	G/TA(GB) CSC COEFF ERR
123	N(21, 1)	HPBW#1(deg) INTERCEPT
124	N(21, 2)	HPBW#1 ZENITH
125	N(21, 3)	HPBW#1(deg) INTERCEPT 1S ERR
126	N(21, 4)	HPBW#1(deg) ZENITH 1S ERR
127	N(21, 5)	HPBW#1(deg) ELEV COEFF
128	N(21, 6)	HPBW#1(deg) CSC COEFF
129	N(21, 7)	HPBW#1(deg) ELEV COEFF ERR
130	N(21, 8)	HPBW#1 CSC COEFF ERR
131	N(22, 1)	HPBW#2(deg) INTERCEPT
132	N(22, 2)	HPBW#2 ZENITH
133	N(22, 3)	HPBW#2(deg) INTERCEPT 1S ERR
134	N(22, 4)	HPBW#2(deg) ZENITH ERR
135	N(22, 5)	HPBW#2(deg) ELEV COEFF
136	N(22, 6)	HPBW#2(deg) CSC COEFF
137	N(22, 7)	HPBW#2(deg) ELEV COEFF ERR
138	N(22, 8)	HPBW#2(deg) CSC COEFF ERR
139	N(24, 1)	D-DECL(deg) INTERCEPT
140	N(24, 2)	D-DECL(deg) ZENITH
141	N(24, 3)	D-DECL(deg) INTERCEPT 1S ERR
142	N(24, 4)	D-DECL(deg) ZENITH 1S ERR
143	N(24, 5)	D-DECL(deg) ELEV COEFF
144	N(24, 6)	D-DECL(deg) CSC COEFF
145	N(24, 7)	D-DECL(deg) ELEV COEFF ERR
146	N(24, 8)	D-DECL(deg) CSC COEFF ERR
147	N(25, 1)	NEF(kFU) intercept
148	N(25, 2)	NEF(kFU) zenith
149	N(25, 3)	NEF(kFU) intercept 1S ERR
150	N(25, 4)	NEF(kFU) zenith 1S ERR
151	N(25, 5)	NEF(kFU) elev coeff
152	N(25, 6)	NEF(kFU) csc coeff
153	N(25, 7)	NEF(kFU) elev coeff err
154	N(25, 8)	NEF(kFU) csc ccoeff err
155	N(26, 1)	NUF(kFU) intercept
156	N(26, 2)	NUF(kFU) zenith

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

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157  N(26, 3)      NUF(kFU) intercept 1S err
158  N(26, 4)      NUF(kFU) zenith 1S err

159  N(26, 5)      NUF(kFU) elev coeff
160  N(26, 6)      NUF(kFU) csc coeff
161  N(26, 7)      NUF(kFU) elev coeff err

162  N(26, 8)      NUF(kFU) csc coeff err
163  N(I,J)        PROG CONSTS I<26:I, 1=A,2=B,etc;J, 1=1,...,10=0, 11=NO SUBSCRIPT
164  S(N0,1)       STAR FLUX (F.U.) @ STANDARD FREQ

165  S(N0,2)       STAR=RT ASC (deg); SOLAR=GHA @ 0 gmt (deg)
166  S(N0,3)       STAR=N. DEC. (deg); SOLAR=N. DEC. @ 0 GMT (deg)
167  S(N0,4)       FLUX AT THE WORKING FREQ (F.U.)

168  T( 9, 1)      STORE STRING P$
169  T(14, 9)      DAYS(STAR EPIC) SINCE 1977=#DAYS SINCE 1900 - 28125
170  T(14,10)      DAYS(SOLAR EPIC) SINCE 1977=#DAYS SINCE 1900 - 28125

171  T(N0, 1)      STAR/SOLAR NAME
172  T(N0, 4)*     SPECTRAL INDEX SECULAR EXPANSION(%/Yr)*1000
173  T(N0, 5)*     SPEC INDEX SECULAR EXPN UNCERTAINTY(%/Yr)*1000

174  T(N0, 6)*     SPECTRAL INDEX * 1000
175  T(N0, 7)*     SPECTRAL INDEX ERR * 1000
176  T(N0, 8)*     FLUX ERR @ STD FREQ (%) * 10

177  T(N0, 9)*     DISK SIZE (ARC MIN) * 100
178  T(N0,10)*     FLUX ERR @ F(%) * 10
179  T(N0,11)*     LINEAR POLZ(%) * 10

180  T(N0,11)s     GHA/hr * 1000
181  T(N0,12)*     LINEAR POLZ LRR(%) * 10
182  T(N0,12)s     N. DLC./hr * 1000

183  T(N0,13)*     POLZ ANG (deg) * 10
184  T(N0,13)s     HORIZONTAL PARALLAX * 1000
185  T(N0,14)*     POLZ ANG ERR (deg) * 10

186  T(N0,14)s     AGE OF NOON (days)
187  T(N0,15)*     FLUX EPOCH, YEAR*10
188  T(N0,16)*     SECULAR DECAY of flux (%/Yr)*100

189  T(N0,17)*     SECULAR DECAY of flux ERR (%/Yr)*100
190  T(N0,18)*     STD FREQ(CHz) * 100
191  T(N0,19)*     MIN FREQ (GHZ)*100 WHERE FLUX CALC VALID

192  T(N0,20)*     MAX FREQ (GHZ)*100 WHERE FLUX CALC VALID
193  T(N0,21)      FLAG: 0=STAR DATA, 1=SOLAR DATA
194  T(N0,22)s     GHA/HR (deg) * 1000

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NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

195 T(M0,23)s N. DEC./hr (deg) \* 1000

### 7.3 FUNCTION LIST ALPHABETICAL BY VARIABLE

NBS2.00 <NBS 9915, 0007> T6 & L5-F10

REVISION # 10

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

1	FLAG 1	STAR FLUX CALC FOR SPECIFIED FREQ & DATE
2	FLAG 1	1=ELPR DATA INPUT
3	FLAG 1	DISK STORACL (F7) <prgm A>
4	FLAG 2	G/T ERRORS CALCULATED FOR SPECIFIC FREQ & DATE
5	FLAG 7	PRT OUT ERR:1=W/O CONSTS
6	FLAG 9	HEALING:1=EYPASS DATE,FREQ,ATN DIAM,G,G/T,G/Ta
7	FNA(N0)	ANT POINT:N0=STAR # IN:H,L1,B1,E1; OUT:A,L,L0 <NBS7411,7449,8339>
8	FNB(Q)	BLEEP: Q=# OF BEEPS
9	FNC(Q)	PAGE HEADING: Q=# SPACES BEFORE PRT HEADING
10	FND(Q)	INIT HARDWARE: 0=VTVM,BRG,NOISE @ NOMINAL, 1=INIT PWR BRG
11	FNL(N0)	ERROR CALC FOR G/T: N0=STAR #
12	FNFA 1	REWIND INT CASSETTE
13	FNFB 0	SITE: W. long, N. lat, alt
14	FNFC 0	SET# CHANGE
15	FNFC 1	SOURCE# CHANGE, RESET MAT A & MAT D
16	FNFG 0	RESTART
17	FNFG 1	ques DATA ON TAPE/DISK,TAPE #
18	FNFG 2	heading G/T,G/Ta,NEF,NUF,Y-factor
19	FNFG 3	heading K1,...K9,k.A-eff,R-eff,S,Xi
20	FNFG 4	BLST FIT 5 CUTS
21	FNFG 5	heading *HPBW #1 =...+...CSC L=... (ant HPBW =...)
22	FNFG 6	heading: G(CE) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) ....
23	FNFG 7	ques: DATA SET#
24	FNFG 8	A\$= !.....!.....!.....!.....!.....!.....!.....!.....!
25	FNFG 9	prt K1,K2,K3,K6,K8,K9,K,A-eff,R-eff,S,Xi
26	FNFG 10	prt A2,C9,D1,N(21,1),T(1,9),C8,D8,D9,J1,N(21,3),T(1,11),C2
27	FNFE 0	ATTN SETTING, FILTER IDENTIFICATION HEADING
28	FNG(Q)	CURVE FIT:0=INIT,-99=CALC FIT (out:I,R2,W1,V5,G(I,J),Y(I))
29	FNH(Q)	HEADINGS: 0=FIT #, 1=TAPE #
30	FNI(Q)	DRAW LINE:1 -;2 --;3 ==;4 ##;5 @@
31	FNJ(Q)	KEY SUB: Q=KEY #, SEE KEY LIST
32	FNK(N0)	K-FACTOR CALC,e.g. K1,K2,...,K9
33	FNL 1	G/T plot (J=19)
34	FNL 1.1	G/T err TABLE: no print variables
35	FNL 1.2	G/T err TABLE: print variables
36	FNL 2	G/Ta plot (J=20)
37	FNL 2.1	G/Ta err TABLE: no print variables
38	FNL 2.2	G/Ta err TABLE: print variables
39	FNL 3	HPBW#1 plot (J=21)
40	FNL 4	HPBW#2 plot (J=22)
41	FNL 6	Y-factor plot (J=24)
42	FNL 7	NEF plot (J=25)



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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

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43 FNL 8      NUF plot (J=26)
44 FNM(Q)     METEOROLOGICAL INFO:0=INPUT DATA,1=PRT DATA,2=SELECT MAN/AUTO

45 FNN(Q)     ANSWER ROUTINE:DISPLAYS Q, SPACE = NO CHANGE
46 FNC(Q)     ANS ROUTINE SEQUENCE
47 FNP(Q)     PRW MEAS:0=#1&#2,1=#1,2=#2,3=PWR,mw (IN: A3,C2,E2,V,FND1)

48 FNQ(Q)     PRGM const(MAT N):1=LIST,2=correct,3=N(I,J) to variables
49 FNR(Q)     READ(ENTLR DATA) DEVICE:2=DVM,3=CLOCK,4=BREAK SWITCHS
50 FNS(Q)     SPACE PAGE Q SPACES

51 FNT(Q)     TIME,DECIMAL HRS:1=SET UP E1 (IN: E3,E5,N4)
52 FNT(Q)     DUMMY USED IN ERROR PRT OUT IN LW63B
53 FNTd(L)    calc: ANT hPBW#1(min of arc)

54 FNU(Q)     PRW RATIO CHECK: IN:C2,E2,C3 OUT:A(7),A(8)
55 FNV(Q)     VOLTAGE RLADING:volt range + channel #/100
56 FNVd 0     RESTART

57 FNVd 1     calc: G/T,G/Ta,NEF,NUF errors
58 FNVd 2     FIT X=EXP(V*(V2-W1)^2)
59 FNVd 3     calc: GRAPH RANGES for AUTO SEQ

60 FNVd 4     calc: LINEAR & CSC FIT PARAMETERS
61 FNVd 5     Q=FNF2 & RETURN
62 FNVd 6     read: RWRK#,SLT,F,T/Ta@90,csc,hPBW@90,csc,Ta

63 FNVd 7     FIT #1 OF 5 CUTS
64 FNVd 8     FIT #2 OF 5 CUTS
65 FNVd 9     calc Ta via G at zenith ,=B2*(D*F/0.313)^2,B2

66 FNVd 10    set FLAG F8 if REWORK# not integer
67 FNVd 11    load PIOR SUMMARY MAT M, MAT N
68 FNVd 12    STORE MAT M & MAT N

69 FNVd 13    calc B,B0,B2,G via B2,G-diff=C7,Ta=H9,B9
70 FNV(Q)     WAIT Q MILLISEC
71 FNX 24     DVM AUTORANGE

72 FNX 27     0.100000 V DVM RANGE
73 FNX 28     1.00000 V DVM RANGE
74 FNX 29     10.0000 V DVM RANGE

75 FNX 30     100.000 V DVM RANGE
76 FNX 31     1000.00 V DVM RANGE
77 FNX 32     DC FILTER OUT

78 FNX 33     DC FILTER IN
79 FNX 34     RATIO: FILTER IN
80 FNX 36     AC VOLTS (not installed)

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

81	FNX 40	OHMS (not installed)
82	FNX 48	PRGM ATTN =15dB
83	FNX 49	PRGM ATTN =14dB
84	FNX 50	PRGM ATTN =13dB
85	FNX 51	PRGM ATTN =12dB
86	FNX 52	PRGM ATTN =11dB
87	FNX 53	PRGM ATTN =10dB
88	FNX 54	PRGM ATTN = 9dB
89	FNX 55	PRGM ATTN = 8dB
90	FNX 56	PRGM ATTN = 7dB
91	FNX 57	PRGM ATTN = 6dB
92	FNX 58	PRGM ATTN = 5dB
93	FNX 59	PRGM ATTN = 4dB
94	FNX 60	PRGM ATTN = 3dB
95	FNX 61	PRGM ATTN = 2dB
96	FNX 62	PRGM ATTN = 1dB
97	FNX 63	PRGM ATTN = 0dB
98	FNX 64	NO RF to BOLOMETER & STD PAD IN
99	FNX 65	RF to BOLOMETER & STD PAD OUT
100	FNX 66	STD ATTN IN
101	FNX 67	STD ATTN OUT
102	FNX 68	NO RF TO BOLOMETER
103	FNX 69	RF TO BOLOMETER
104	FNX 72	NO RF to BOLOMETER & STD PAD IN (avoid-USE FNX64)
105	FNX 73	RF to BOLOMETER & STD pad OUT (avoid-USE FNX65)
106	FNX 74	STD ATTN IN (avoid - use FNX66)
107	FNX 75	STD attn OUT (avoid - use FNX67)
108	FNX 76	NO RF to BOLOMETER (avoid - use FNX68)
109	FNX 77	RF to BOLOMETER (avoid - use FNX69)
110	FNX 80	NOISE ADD #1 & #2 ON
111	FNX 81	NOISE ADD #1 & #2 OFF
112	FNX 82	NOISE ADD #1 ON
113	FNX 83	NOISE ADD #1 OFF
114	FNX 84	NOISE ADD #2 ON
115	FNX 85	NOISE ADD #2 OFF
116	FNX 88	NOISE ADD #1 & #2 ON (avoid - use FNX80)
117	FNX 89	NOISE ADD #1 & #2 OFF (avoid - use FNX81)
118	FNX 90	NOISE ADD #1 ON (avoid - use FNX82)

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

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119  FNK 91      NOISE ADD #1 OFF  (avoid - use FNK83)
120  FNK 92      NOISE ADD #2 ON   (avoid - use FNK84)

121  FNK 93      NOISE ADD #2 OFF  (avoid - use FNK85)
122  FNK 96      OPENS MULTIPLEXER so can use frnt panel inputs
123  FNK 97      OPENS MULTIPLEXER so can use front panel inputs

124  FNK 98      OPENS MULTIPLEXER so can use front panel inputs
125  FNK 99      OPENS MULTIPLEXER so can use frnt panel inputs
126  FNK100      J357 INPUT(e.g. ext pwr meter):channel #11 = 110 0100

127  FNK101      PWR BRDG vs FINE REF: channel #10 = 110 0101
128  FNK102      PWR BRDG vs REF VOLT, set fine volt:ch #9 = 110 0110
129  FNK103      PRW BRDG OUTPUT: channel #8 = 110 0110

130  FNK104      D/A REFERENCE voltage: channel #7 = 110 1000
131  FNK105      CRYSTAL DIODE voltage: channel #6 = 110 1001
132  FNK106      D/A OUTPUT: channel #5 = 110 1010

133  FNK107      +12 volts, RF UNIT: channel #4 = 110 1011
134  FNK108      +20 volts, RF UNIT: channel #3 = 110 1100
135  FNK109      DEW POINT: channel #2 = 110 1101

136  FNK110      TEMP (F/100): channel #1 = 110 1110
137  FNK111      GROUND CVM: channel #0 = 110 1111
138  FNK(Q)      PLOT DATA: 1=PRT HEADING

139  FNZ(N0)     Xi=FNK(N0)*C1*S(N0,4)*1E-26
140  KEYa 0      RESTART
141  KEYa 1      CHANGE PRGM CONST & MODIFY CORRESPONDING N(I,J)

142  KEYa 2      LIN1: 1=SITE PREP, 2=MEAS, 3=REWORK
143  KEYb 0      RESTART:0=RESTART,1=LINKMEAS,2=REWORK,3=KEY LIST
144  KEYb 1      UPDATE:RUN#,DATE,SITE

145  KEYb 2      UPDATE: FREQ,BW,ANT PARAMETERS
146  KEYb 3      UPDATE:ANT POINTING ERROR
147  KEYb 4      UPDATE:T,G/T,Ta,PWR RESF

148  KEYb 5      UPDATE:TEMP, DEW PT
149  KEYb 6      UPDATE:SUN/MOON ALMINAC DATA
150  KEYb 7      PRT:SITE & FLUX DATA

151  KEYb 8      CALC:STAR FLUX @ f
152  KEYb 9      PRT:TYPICAL G/T VALUES AND ERRORS
153  KEYb 10     STORE: S,T,N

154  KEYb 11     PRT:LIST OF ALTERATE STAR ERR
155  KEYb 12     PRT: ELLV vs GMT
156  KEYb 13     UPDATE: N(I,J)

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

157	KEYc	0	RESTART:1SKY,2G/T,3EIRP,4LNK,5NEW TAPE,0MASTER RESTART
158	KEYc	1	STAR:RESTART @ N
159	KEYc	2	LIRP:START @ SET ?
160	KEYc	3	REFIT 5 CUTS: USED AFTER ONE OF THE CUTS IS RETAKED
161	KEYc	4	STAR FLX:routine to estab ANT BIAS
162	KEYc	5	CHANGE BIAS:HR ANG, DECL, AZ, ELEV
163	KEYc	6	CHANGE:input ATTN (db), FILTER #
164	KEYc	7	CHANGE: TA = ADDED NOISE,K
165	KEYc	8	CHANGE: T(syst)/Ta
166	KEYc	9	CHANGE STD attn(C2):0=OUT when noise add ON, 1=IN
167	KEYc	10	STORE CUTS TAKEN
168	KEYc	11	STORE INT: MAT N,S,T and PRGM
169	KEYc	12	STORE:MAT M(summary data),N(prgm consts) on ext CAS/DISK
170	KEYc	13	LIST G/T SUMMARY
171	KEYc	14	LIST CURRENT DATA MAT D
172	KEYc	15	CHANGE FREQ & calc new STAR FLUX
173	KEYc	16	CHANGE # PTS IN PARABOLIC FIT ROUTINE
174	KEYc	17	CHANGE: C/TA(db)
175	KEYc	18	CHANGE NOISE ADD SOURCES (C3):0=#1&#2,1=#1,2=#2,3=PWR(mW)
176	KEYc	19	LAST MEASUREMENT:initiates storage steps
177	KEYd	0	RESTART:0REWORK,1LOAD,2AUTO SEQ,3DEL,4G/T,5FIT,6PLT,7ERR
178	KEYd	1	RESTART @ N=?
179	KEYd	2	calc:STAR FLUX VALUES,Ta,eff area
180	KEYd	3	ENTER TEMP,A(3);AND DEW PT ,A(4) USED IN REWORK
181	KEYd	4	prt: G/T DATA SUMMARY with page heading
182	KEYd	5	SORT,FIT and LIST DATA
183	KEYd	6	prt: G/T DATA SUMMARY (no heading)
184	KEYd	7	STORE MAT M & MAT N
185	KEYe	0	RESTART:0=KEY LIST,1=AUTO CK,2=NO AUTO(F2=0)
186	KEYe	1	CHECK LIST
187	KEYe	2	CHECK DVM
188	KEYe	3	CHECK CHANNEL VOLTAGES
189	KEYe	4	CHECK PRGM ATTENUATORS
190	KEYe	5	CHEK PWR,TYPEIV & ATTN STABILITY
191	KEYe	6	CHECK NOISE ADD STABILITY
192	KEYe	9	ques: NLW FREQ,BW,INPUT ATTN,SIML STAR NOISE
193	read	CLOCK	ENTER(3,*)C,D:C=#1 THUMB SW,D=SW #2 #3 #4 HHMM.SS
194	read	DVM	ENTER(2,*)A,B: A=FUNCTION, B=VOLTAGE
195	read	SW	BYTE 4=INTEGER SUM OF BINARY SWITCHES
196	read	SW Y	BIAND(ROT(KEYTE4,Y)1)=1 IF SWITCH Y IS UP

## 7.4 VARIABLES LIST ALPHABETICAL BY MEANING

NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

1	V	-ALPHA, GAUSSIAN COEFF
2	D3	ADDED NOISE ERROR, %
3	B9	ADDED NOISE, K
4	B2, B3	ANTENNA APERTURE EFFICIENCY, ANT RADIATION EFFICIENCY
5	D	ANTENNA DIAMETER (FT)
6	B9	ANTENNA EFFECTIVE AREA
7	G	ANTENNA GAIN, REL
8	D5	ANTENNA POINTING ERROR (deg)
9	K5	ANTENNA POINTING FACTOR
10	K6	ANTENNA POLARIZATION FACTOR
11	B4	ATMOSPHERIC BRIGHTNESS TEMPERATURE, K
12	K1	ATMOSPHERIC ABSORPTION TRANSMISSION COEFF
13	A3	ATTENUATION OF STD ATTN (abs>1, NOT dB), RELATED TO N(13,10)
14	E0	ATTENUATION (dB) OF PROGRAM ATTENUATOR, TEMPORARY VALUE
15	M1...M4	ATTN OF PGM 1,2,4,8 @ 30 MHz, PGM USES N(13,1...4)
16	M6...M9	ATTN OF PGM 1,2,4,8 @ 70 MHz, pgm uses N(13,6...9)
17	F9	ATTN VALUE OF LAST PROG ATTN IN FNW
18	E2	ATTENUATION (dB) OF PROGRAM ATTENUATOR
19	E6	ATTENUATION (dB), MANUAL ATTENUATOR
20	A	AZIMUTH (deg) OR DUMMY
21	X5	AZIMUTH BIAS (deg)
22	W	BANDWIDTH (MHz)
23	K3	BANDWIDTHS EFFECTS FACTOR
24	J	BRDG PWR when NOISE ADL sources ON
25	Z5	C/KT MEAS: T(ONT)/Ta FOR UPPER FREQ
26	B1	CODE FOR SATELLITE CARRIER MEAS: 0=SKY, 1=-F, 2=RCR @ F, 3=+F, 4=OTHER
27	Z	COLD SKY POWER / Ta
28	T2	CURRENT MEASUREMENT TIME
29	G(I,J)	CURVE FIT MATRIX
30	N2	CUT NUMBER
31	C1	$C^2 / (8 * \pi * K * F^2)$
32	D(T6,I)	DATA MATRIX: SEE MATRIX LIST
33	C	DATE, DECIMAL
34	N	DATE, DECIMAL FOR MOON DATA
35	E	DAYS SINCE 1900.00
36	B1	DECL OFFSET (deg)
37	B6	DEW POINT (F)
38	K4	DIFFERENTIAL SKY TEMPERATURE FACTOR
39	D8	DIFFUSIVE ATTENUATION ERP, %
40	K8	DIFFUSIVE ATTENUATION FACTOR
41	V8	DISK OR TAPE #
42	A\$, B\$	DUMMY

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

43	C,Q0,Q1	DUMMY
44	C2,Q3	DUMMY
45	B(I,J)	DUMMY MATRIX
46	F(I)	DUMMY MATRIX
47	V8	DV, RF ON
48	V7	DV,#1 RF OFF
49	V9	DV,#2 RF OFF
50	L4	EFFECTIVE OXYGEN LENGTH, Km
51	E	EIRP*G/Ta
52	E1	EIRP:PWR no noise add (mW)
53	E3	EIRP:PWR+noise add #1 (mW)
54	L4	EIRP:PWR+noise add #2 (mW)
55	E5	EIRP:PWR+noise add #1 & #2 (mW)
56	L1	ELEVATION REFRACTION CORRECTION,deg
57	L1	ELEVATION FOR FITTING G/T OR G
58	X6	ELEVATION BIAS (deg)
59	L	ELEVATION(deg)
60	L0	ELEVATION--NO REFRACTION CORRECTION
61	C2	ERROR enhancement factor for NEF,NUF compared to G/T
62	F4	FILE # OF N7=1, STARTING M(40,1)
63	F4	FILE LOAD #
64	A1	FILTER #
65	C9	FILTER BANDPASS(MHz)
66	C8	FILTER FREQ (MHz)
67	O1,O2,O3	FILTER#1(2.5MHz @ 30MHz) CONSTS:N(15,1),N(15,2),N(15,3)
68	O6,O7,O8	FILTER#2(1MHz @ 70MHz) CONSTS:N(15,6),N(15,7),N(15,8)
69	P1,P2,P3	FILTER#3 (2.5MHz @ 70MHz) CONSTS:N(16,1),N(16,2),N(16,3)
70	P6,P7,P8	FILTER#4 (5.3MHz @ 70MHz) CONSTS:N(16,6),N(16,7),N(16,8)
71	H1	FIT TO G/T or NEF data (3*1S/SQR(#PTS)),dB
72	F5	FLAG IN D:1=PRGM REWORK
73	F8	FLAG IN D:1=NO FIT CUTS
74	L0	FLAG IN D:0=GRAPH,1=ERR PRT OUT-no VARIABLES,2=with variables
75	F4	FLAG IN E:1=SIMULATED NOISE ADD,2=EARHT TERMINAL
76	F5	FLAG IN E:1=NOISE ADD #1 WORKS
77	F6	FLAG IN E:0=PRGM ATTN,1=STD ATTN
78	F6	FLAG IN E:1=NOISE ADD #2 WORKS
79	F6	FLAG TASK:1=NEW SITE,2=MEAS,3=REWORK,0=MANL VIA KEYBOARD
80	F6	FLAG-AUTO SEQUENCE:1=YES



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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

81	F1	FLAG-GRAPH:0=NO,1=DATA,2=&FIT,3=FIT,4=EXIT
82	C3	FLAG-NOISE ADD: 0=#1&2,1=#1,2=#2
83	F5	FLAG-PROGR REWORK PATTLRN:0=NO
84	F2	FLAG-PRT:0=ALL,1=PROC DATA,2=INPUT ASSUMPS,3=G/T EPR,4=ANT ELEV vs GMT
85	F7	FLAG-PWR LEVEL: 0=CONST, 1=STEPPED (in E)
86	F3	FLAG-SORT & FIT:1=G/T-ELEV,2=G/T-CSC,3=DIP-ELEV,4=DIP-TIME
87	F5	FLAG: 0,1= volt table in LINEARITY ck, 2,3=stability GRAPH (in E)
88	F7	FLAG: 0=CASSETTE BEING USED,1=DISK
89	F3	FLAG: 0=MANUAL READ TEMP,HUMIDITY, 1=AUTO TEMP,DEW PT
90	F2	FLAG: 0=NORMAL,1=DIFF PLOT DATA,2=DIFF PLOT OF 5 CUTS
91	F1	FLAG: 0=STAR,1=SATELLITE
92	F1	FLAG: 1=SUBROUTINE LOADED
93	F2	FLAG:0=CSC fit, 1=LINEAR fit
94	F2	FLAG:0=NO AUTO CHECK,1=YES (in E)
95	F1	FLAG:0=PRT PWR & VOLTS, 2=GRAPH PWR RATIO (in E)
96	F6	FLAG:0=RESTART,1=SKY,2=C/T,3=EIRP,4=LINK
97	F3	FLAG:0=XTAL,1=TYPE IV bridge (in E)
98	C2	FLAT-56B ATTN IN NOISE ADD PWR MEAS:0=NO,1=YES
99	F8	FLG in E:(KEY 5)0=GRAPH,1=LIST,(KEY 6)0=SIML NOISE ADD,1=EARTH TERM
100	Q3	FLG:(LOC SITE DATA).(F6=1ASK)(F4=PRM CHANGE?)(F7=DISK)
101	F0	FREQ ERR, %
102	F	FREQ OF MEASUREMENT(GHz)
103	F3	FREQ(GHz) SELECTED FOR REWORK, 0=REWORK ALL FREQ
104	L9	FREQ,DIAM,G/T HEADING
105	C7	G via HPBW - G via G/Ta, dB
106	C(I,J)	G(I,J) INVERSE OR DUMMY
107	T1	G/T OR G/TA VALUE
108	E5	G/T ERR-ANTENNA POINTING
109	E6	G/T ERR-ANT POLARIZATION
110	E1	G/T ERR-ATMOSPHERIC ABSORPTION
111	E8	G/T ERR-ATMOSPHERIC DIFFUSION
112	E9	G/T ERR-ATMOSPHERIC REFRACTION
113	E3	G/T ERR-BANDWIDTH
114	E4	G/T ERR-DIFFERENTIAL SKY TEMP
115	S	G/T ERR-FLUX
116	E0	G/T ERR-FREQ
117	E2	G/T ERR-STAR SHAPE
118	E7	G/T ERR-SYSTEM RESPONSE

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

119	Y1	G/T ERR-Y factor (C8*Y5)
120	M	G/T RELATIVE
121	B7,B8	G/Ta(deg) ZENITH COEFF,CSC COEFF
122	X2	GAMMA,PARABOLIC FIT
123	A2	GAUSS CURVE FIT ERROR,% dT
124	C6	GHA TO ARIES @ 0 GMT (hrs)
125	E9	GHA TO ARIES(deg)
126	E	HOOR ANGLE(deg)
127	F	HOOR ANGLE OFFSET (deg)
128	I	HPBW
129	E7	HPBW FIT BY GAUSSIAN CURVE TO DRIFT CURVE
130	D2	HPBW UNCERTAINTY,%
131	B	HPBW#1(min of arc),AS MEASURED-NO KANDA CORRECTION
132	B0	HPBW(minutes) with Kanda correction
133	Q3	HPBW,ANTENNA ALONE(i.e. with KANDA CORRECTION)
134	N(I,J)	INPUT DATA CONST, SEE MATRIX LIST
135	T(N0,J)	INPUT STAR DATA: SEE MATRIX LIST
136	H5	INSTR PWR RESPONSE FACTOR
137	C9	INSTRUMENTAL POWER RESPONSE ERR,%
138	X4	K*S/2/k
139	K	K1*K2*...*K9
140	J1	K8 for POINT SOURCL
141	N4	LARGEST N3
142	I	LOOP VARIABLE
143	J1	LOOP VARIABLE
144	M1	LOOP VARIABLE
145	X1	LOOP VARIABLE
146	H5	MAIN PROGRAM HEADING
147	Y(I)	MATRIX USLD IN CURVE FIT OR DUMMY
148	J	MAXIMUM FLUX IN F.U.
149	E6	MEASUREMENT # OF FIT GAUSSIAN CURVE TO DRIFT CURVE
150	M3	MEASUREMENT # @ MAXIMUM AMPLITUDE
151	N	MEASUREMENT NUMBER
152	E2,E3	MONTH, DAY
153	T6	N-6*(N7-1)
154	V7	N3 OF STAR MAX
155	N1	NO. OF STAR SOURCES
156	R5	NUMBER OF POINTS FIT TO PARABOLA

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

157	N9	NUMBER POINTS IN FIT
158	G4	OXYGEN ABSORPTION (dB/Km)
159	F6	P(ONT) @ +F: in C/kT meas
160	F5	P(ONT) @ -F: in C/kT meas
161	L6	P(ONT),mk=(F5+F6)/2: in C/kT MEAS
162	F2	P/Pa for LOWER FREQ ONT: in C/kT meas
163	N5	PAGE NUMBER
164	V5	PARABOLIC FIT PARAMETER h
165	I5	PLOT UNIT
166	P	POWER MEASURED, MILLIWATTS
167	U	POWER NORMALIZATION
168	Q3	POWER WITH NOISE ADD ON
169	S3	PREDICTED MEASUREMENT # FOR MAXIMUM STAR PWR
170	P5	PROJECT HEADING
171	N3	PWR MEASUREMENT # WITHIN A CUT
172	L9	PWR(m.) ON SAT SIGNAL
173	A8	RATIO #1 add/#2 add uses N(18,5 or 10)
174	R0	RATIO #1add/#2add @ 70 MHz, pgm uses N(18,10)
175	F	RECEIVER FREQ (GHz)
176	F1	RECEIVER GAIN SLOPE/mHz
177	K9	REFRACTIVE ATTENUATION FACTOR
178	L6	REFRACTION CONST #1
179	L9	REFRACTION CONST #2
180	D9	REFRACTIVE ATTENUATION ERROR, %
181	LS	REMARKS
182	R	REMARKS: SEE REMARK LIST
183	R2	RESIDUALS FROM CURVE FIT
184	A0	REWORK #
185	N6	RUN #
186	T2	RUN/SET
187	J	SELECT FUNCTION: 19=C/T, 20=G/TA, 21=HPBW#1, 22=#2, 24=DECL, 25=NLF, 26=NUF
188	Z5	SERROR VARIABLE
189	N7	SLT #
190	A(N7)	SLT DATA: SEE MATRIX LIST
191	H	SIMULATED STAR NOISE (dB)
192	C0	SITE ELEV (Km)
193	C4,C5	SITE: W.LONG (deg), N. LAT (deg)
194	D0	SKY BACKGROUND ERR, 0.9/F^2

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

195	C1	SPACE LOSS
196	F1	SFACE LOSS: in C/kT MEAS
197	E7	STANT RANGE, $10^6$ Km
198	S(I,J)	STAR DATA: SEE MATRIX LIST
199	S\$	STAR NAME
200	N0	STAR NUMBER, CURRENT
201	D1	STAR SHAPE ERR, %
202	K2	STAR SHAPE FACTOR
203	F1	STAR SHAPE ERROR, %
204	F9	STORE SET # OF SUMMARY OF REWORK DATA
205	X\$	SUBROUTINE HEADING
206	M1	SUM ON P
207	V4	SUM ON $P \cdot X^2$
208	V5	SUM ON $P \cdot X$
209	V6	SUM ON $P^2$
210	F2	SUM ON X
211	V2	SUM ON $X^2$
212	V3	SUM ON $X^3$
213	V1	SUM ON $X^4$
214	F3	SUM ON Y
215	M(N7,J)	SUMMARY DATA: SEE MATRIX LIST
216	N8	SUMMARY DATA # = M(50,1) = N7+F4
217	A4,A5,A6	SYST CONSTS: PRGM USES N(1,4), N(1,5), N(1,6)
218	K7	SYSTEM RESPONCE FACTOR
219	F9	T(sky)/Ta: in C/kT meas
220	T	T(syst)
221	B6	T/TA CSC COEFF
222	B5	T/TA ZENITH
223	B5	TEMPERATURE(F)
224	E3	TIME DLLAY TO SET ANTENNA (SEC)
225	T1	TIME OF 1st MEASUREMENT
226	E1	TIME OF STAR PEAK (hrs)
227	X	TIME VARIABLE, $2 \cdot I/N4 - 1$
228	X1	TIME VARIABLE, $2 \cdot (N3 - M3)/N4$
229	S	TIME(hrs), CURRENT
230	E8	TIME(hrs)/(ARC deg)
231	E5	TIME/MEASUREMENT (hrs)
232	E4	TRANSMITTER POWER, WATTS

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VARIABLES LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

233	V6	$T_{star}/T_a = \exp(X-F(2)*W1^2)$
234	F0	VALUE OF C2 IN FNW
235	X2	VARIABLE IN FNG(N3)
236	W1	VARIANCE OF $P(STAR)/P(ADD)$
237	V	VOLTAGE ACROSS PWR BRIDGE
238	G5	WATER ABSORPTION, #1 CONST (dB/Km)
239	G6	WATER ABSORPTION, #2 CONST (dB/Km)
240	L7	WATER DENSITY (gm/cm <sup>3</sup> )
241	L5	WATER PATH LENGTH CONST#1
242	L6	WATER PATH LENGTH CONST#2, Km
243	X1	$X1 = G/dT(star)$
244	Y	Y-FACTOR
245	C8	Y-FACTOR ERR, %
246	Y5	$Y/(Y-1)$
247	E1	YEAR
248	L5	YEARS (JULIAN) SINCE 1900 /4
249	E6	YEARS SINCE 1977
250	Z1	ZENITH ATM ATTN, dB
251	R1	ZERO FOR GRAPH
252	Q5, Q6	$dP(a\alpha)$ in C/KT meas: @ -F, @ +F
253	V9	$dT(STAR)/TA$ PREDICTED
254	V7	$dT(star)/TA$

## 7.5 MATRIX LIST ALPHABETICAL BY MEANING

NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

1	D(T6, 3)*	# OF MEAS(N4)
2	T(N0,14)s	AGE OF MOON (days)
3	A( 3)	AMBIENT TEMP(F) *10
4	N(13, 6)	ATTN OF 1dB prgm @ 70:#3=0.976,#4=0.947,#5=0.938,#6=0.973
5	N(13, 7)	ATTN CF 2dB PRGM @70:#3=1.890,#4=1.95,#5=1.854,#6=1.957
6	N(13, 1)	ATTN of 1db prgm @ 30MHz:#3=0.961
7	N(13, 2)	ATTN cf 2db prgm @ 30MHz:#3=1.881
8	N(13, 3)	ATTN cf 4dB prgm @ 30MHz:#3=3.947
9	N(13, 8)	ATTN of 4dB prgm @ 70:#3=3.909,#4=3.87,#5=3.957,#6=3.924
10	N(13, 4)	ATTN of 8dB prgm @ 30MHz:#3=7.881
11	N(13, 9)	ATTN cf 8dB PRGM @ 70:#3=7.896,#4=7.86,#5=7.845,#6=7.949
12	N(13, 5)	ATTN of STD RES 30MHZ:#3=5.922,#6=4.779
13	N(13,10)	ATTN cf STD @ 70:#3=5.966,#4=5.92,#5=6.11,#6=6.1
14	N( 1, 7)	ATTN+meter(dB/10) 5.3@70:#3=16.15,#4=17.3,#5=15.27,#6=-17.55
15	L(6,N3+2)x	ATTN,TOTAL: E2+E6
16	D( 1, 1)x	AZIMUTH:(Az(deg)-180)*100
17	D(T6, 1)*	AZIMUTH:(Az(deg)-180)*100
18	M(N8, 5)x	C/kT(dB)
19	A( 6)	CLOUD COVER * 100 + WIND(mph)
20	M(N8, 1)x	CODE + .07
21	A( 7)x	CODE(E1):0=SKY, 1=-F, 2=RCR @ F, 3=+F, 4=OTHER
22	N(24, 1)	D-DECL(deg) INTERCEPT
23	N(24, 2)	D-DECL(deg) ZENITH
24	N(24, 3)	D-DECL(deg) INTERCEPT 1S ERR
25	N(24, 4)	D-DECL(deg) ZENITH 1S ERR
26	N(24, 5)	D-DECL(deg) LLEV COEFF
27	N(24, 6)	L-DECL(deg) CSC COEFF
28	N(24, 7)	D-DECL(deg) ELEV COEFF ERR
29	N(24, 8)	D-DECL(deg) CSC COEFF ERR
30	N( 1, 5)	DAC RLF volt:#3=6.313,#4=6.367,#5=6.284,#6=6.24
31	N( 1, 6)	DAC mult=-(chr1#9-#8)/#7:#3=0.3173,#4=0.32,#5=0.3187,#6=0.32
32	T(14,10)	DAYS(SOLAR EPIC) SINCE 1977=#DAYS SINCE 1900 - 28125
33	T(14, 9)	DAYS(STAR EPIC) SINCE 1977=#DAYS SINCE 1900 - 28125
34	D(T6, 5)*	DECL OFFSET FROM PREDICTED STAR CENTER: (B1+L1)deg *1000
35	A( 4)	DEW PT(F) *10
36	T(N0, 9)*	DISK SIZE (ARC MIN) * 100
37	M(N8, 7)x	EIRP(dBw)+G/TA(dB) = E
38	M(N8, 1)	ELEV(deg) + STAR#/100
39	L( 1, 2)x	ELEV(deg)*100
40	D(T6, 2)*	ELEVATION(deg)*100
41	N(15, 1)	FILT#1(2.5@30) NOISE BW:#3=3.915,#4=3.887,#5=3.643,#6=3.552
42	N(15, 2)	FILT#1(2.5@30)N1,MHz:#3=0.00938,#4=0.01526,#5=0.0178



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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

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43 N(15, 4)    FILT#1(2.5@30)LOSS,dB:#3=3.092,#4=2.711,#5=2.391,#6=2.560
44 N(15, 6)    FILT#2(1@70)NOISE BW:#3=1.193,#4=1.225,#5=1.23,#6=1.250

45 N(15, 7)    FILT#2(1@70)N1,MHz:#3=-0.1043,#4=0.0817,#5=0.1271
46 N(15, 9)    FILT#2(1@70)LOSS,dB:#3=4.970,#4=4.910,#5=4.870,#6=5.634
47 N(16, 1)    FILT#3(2.5@70)NOISE BW:#3=2.808,#4=2.910,#5=2.937,#6=2.875

48 N(16, 2)    FILT#3(2.5@70)N1,MHz:#3=-0.102,#4=0.0108,#5=-0.130
49 N(16, 4)    FILT#3(2.5@70)LOSS,dB:#4=5.78,#5=5.84,#6=5.814
50 N(16, 6)    FILT#4(5.3@70)NOISE BW:#3=5.734,#4=5.80,#5=5.856,#6=5.671

51 N(16, 7)    FILT#4(5.3@70)N1,MHz:#3=-0.14,#4=-0.0782,#5=0.011
52 N(17, 6)    FILT#6(0.06@70MHz)NOISE BW,MHz:#6=0.083
53 N(17, 7)    FILT#6(0.06@70MHz)N1,MHz:#6=0.00178

54 N(17, 9)    FILT#6(0.06@70MHz)INSEER LOSS,dB:#6=4.719
55 L( 3, 2)x   FILTER BANDWIDTH,MHz (W)*10
56 N(15, 3)    FILTER#1(2.5MHz @ 30MHz):2nd CONST

57 N(15, 8)    FILTER#2(1MHz @ 70MHz):2nd CONST
58 N(16, 3)    FILTER#3(2.5MHz @ 70MHz):2nd CONST
59 N(16, 8)    FILTER#4(5.3MHz @ 70MHz):2nd CONST

60 L(T6, 7)*   FIT MEAS # AT PEAK * 100
61 L( 2, 1)x   FLAG C2: 0=NO STD ATTN WHEN NOISE ADD ON, 1=STD ATTN WHEN ...
62 T(N0,21)    FLAG: 0=STAR DATA, 1=SOLAR DATA

63 S(N0,4)     FLUX AT THE WORKING FREQ (F.U.)
64 T(N0,15)*   FLUX EPOCH, YEAR*10
65 T(N0, 8)*   FLUX ERR @ STD FREQ (%) * 10

66 T(N0,10)*   FLUX ERR @ F(%) * 10
67 M(N8, 6)    FREQ (GHz)
68 A( 2)       FREQ(MHz)

69 M(N8, 2)*   G/T(dB)
70 N(19, 6)    G/T(dB) CSC COEFF
71 N(19, 8)    G/T(dB) CSC COEFF ERR

72 N(19, 5)    G/T(dB) ELEV COEFF
73 N(19, 7)    G/T(dB) ELEV COEFF ERR
74 N(19, 1)    G/T(dB) INTERCEPT

75 N(19, 3)    G/T(dB) INTERCEPT 1S ERR
76 N(19, 2)    G/T(dB) ZENITH
77 N(19, 4)    G/T(dB) ZENITH 1S ERR

78 N(20, 4)    G/TA ZENITH 1S ERR
79 M(N8, 3)*   G/TA(dB)
80 N(20, 6)    G/TA(dB) CSC COEFF

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

81	N(20, 8)	G/TA(GB) CSC COEFF ERR
82	N(20, 5)	G/TA(GB) LLEV COEFF
83	N(20, 7)	G/TA(GB) ELEV COEFF ERR
84	N(20, 1)	G/TA(GB) INTERCEPT
85	N(20, 3)	G/TA(GB) INTERCEPT 1S ERR
86	N(20, 2)	G/TA(GB) ZENITH
87	D( 5, 2)x	GAIN SLOPE OF RCR (P1) * 1000
88	T(N0,22)s	GHA/HR (deg) * 1000
89	T(N0,11)s	GHA/hr * 1000
90	T(N0,13)s	HORIZONTAL PARALLAX * 1000
91	M(N8, 4)*	HPBW#1 (deg)
92	N(21, 8)	HPBW#1 CSC COEFF ERR
93	N(21, 2)	HPBW#1 ZENITH
94	N(21, 1)	HPBW#1(deg) INTERCEPT
95	N(21, 3)	HPBW#1(deg) INTERCEPT 1S ERR
96	N(21, 4)	HPBW#1(deg) ZENITH 1S ERR
97	N(21, 5)	HPBW#1(deg) ELEV COEFF
98	N(21, 6)	HPBW#1(deg) CSC COEFF
99	N(21, 7)	HPBW#1(deg) ELEV COEFF ERR
100	A(10)*	HPBW#1*10^4
101	N(20, 5)*	HPBW#2 (deg)
102	N(22, 2)	HPBW#2 ZENITH
103	N(22, 1)	HPBW#2(deg) INTERCEPT
104	N(22, 3)	HPBW#2(deg) INTERCEPT 1S ERR
105	N(22, 4)	HPBW#2(deg) ZENITH ERR
106	N(22, 5)	HPBW#2(deg) LLEV COEFF
107	N(22, 6)	HPBW#2(deg) CSC COEFF
108	N(22, 7)	HPBW#2(deg) ELEV COEFF ERR
109	N(22, 8)	HPBW#2(deg) CSC COEFF ERR
110	D(5,N3+2)x	LGT(PWR METER VOLTAGE)*10^4
111	D(T6, 6)rw	LGT(cT/Tadd)*10^4
112	T(N0,11)*	LINEAR POLZ(%) * 10
113	T(N0,12)*	LINEAR POLZ ERR(%) * 10
114	D(T6, 6)*	LOG(((Tstar+Tsystem)/Tadd)/U)*10^4
115	D(T6,N3+7)	LOG(P/U)*10^4: P=PWR MEAS mw, U=PWR REF
116	N(16, 9)	LOSS,GB:#4=4.18,#5=3.14,#6=4.083
117	D( 2, 2)x	MANUAL ATTN SETTING,GB (dB)
118	T(N0,20)*	MAX FREQ (GHz)*100 WHERE FLUX CALC VALID

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

119	T(N0,19)*	MIN FREQ (GHz)*100 WHERE FLUX CALC VALID
120	T(N0,12)s	N. DEC./hr * 1000
121	T(N0,23)s	N. DEC./hr (deg) * 1000
122	N(N8, 8)*	NEF (kFU)
123	N(25, 6)	NEF(kFU) csc ccoeff
124	N(25, 8)	NEF(kFU) csc coeff err
125	N(25, 5)	NEF(kFU) elev coeff
126	N(25, 7)	NEF(kFU) elev coeff err
127	N(25, 1)	NEF(kFU) intercept
128	N(25, 3)	NEF(kFU) intercept 1S ERR
129	N(25, 2)	NEF(kFU) zenith
130	N(25, 4)	NEF(kFU) zenith 1S ERR
131	A( 9)x	NCT USED
132	N(N8, 9)*	NEF (kFU)
133	N(26, 6)	NUF(kFU) csc coeff
134	N(26, 8)	NUF(kFU) csc ccoeff err
135	N(26, 5)	NUF(kFU) elev coeff
136	N(26, 7)	NUF(kFU) elev coeff err
137	N(26, 1)	NUF(kFU) intercept
138	N(26, 3)	NUF(kFU) intercept 1S err
139	N(26, 2)	NUF(kFU) zenith
140	N(26, 4)	NUF(kFU) zenith 1S err
141	D( 3, 1)x	NUMBER OF MEAS(N4)
142	M(40, 1)	NUMBER OF SUMMARY SLOTS STORED IN MATRIX M
143	M(40, 3)	NUMBER OF FILES USED IN DISK STORAGE
144	M(N8, 6)C	NUMBER OF POINTS IN DIP CURVE
145	N( 1, 9)	NUMBER OF POINTS IN FIT
146	M(N8, 8)x	QNT/1acc: (F2+Z5)/2
147	D( 4, 1)x	F/Pacc(ave of set):LGT(F/Pacc)10^4
148	T(N0,13)*	POLZ ANG (deg) * 10
149	T(N0,14)*	POLZ ANG ERR (deg) * 10
150	N(I,J)	PROG CONSTS I<26:1, 1=A,2=B,etc;J, 1=1,...,10=0, 11=NO SUBSCRIPT
151	A( 7)*	PWR LEVEL, microwatts
152	A( 8)	PWR RATIO CHLCK:micrcbells/10
153	L(1,N3+2)x	PWR WITH noise add OFF @ EOLO: LCT(PWR)*10^4
154	L( 6, 1)x	PWR due to NOISE ADD,mw:LGT(PWF#2-PWR#1)*10^4
155	M(N8, 4)x	PWR due to Ta (mw)
156	D( 5, 1)x	PWR#1,mw(ave,noise add OFF):LGT(PWR)*10^((L2+L6)/10)*10^4

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

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157 M(N8, 3)x PWR(PW)
158 D(2,N3+2)x PWR(noise add ON): LG1(BOLO PWR)*10^4

159 M(N8, 2)x PWR/Pa
160 D(3,N3+2)x PWR/Pa add: LGT(P/Pa add)*10^4
161 M(N8, 9)x Pa add(MW): (F5+F8)/2

162 N( 1, 8) RATIO #1 add/#2 add @ MICROWAVE FREQ
163 N(18, 5) RATIO #1 add/#2 add @ 30MHz
164 N(18,10) RATIO #1 add/#2 add @ 70:#4=0.515,#5=0.526,#6=0.2468

165 A( 5) RELATIVE HUMIDITY(%) *10
166 N( 1,10) REWORK #
167 A( 1) RUN/SET = 100*N6+N7: N6=RUN#, N7=SET#

168 M(N8,10) RUN/SET: N6+N7/100
169 T(NC,16)* SECULAR DECAY of flux (%/Yr)*100
170 T(NC,17)* SECULAR DECAY of flux ERR (%/Yr)*100

171 A(10)x SLANT DIST(Km): LGT(E7)*1000
172 T(N0, 5)* SPEC INDEX SECULAR EXPN UNCERTAINTY(%/Yr)*1000
173 T(N0, 4)* SPECTRAL INDEX SECULAR EXPANSION(%/Yr)*1000

174 T(N0, 6)* SPECTRAL INDEX * 1000
175 T(NC, 7)* SPECTRAL INDEX ERR * 1000
176 M(N8, 1)c STAR #/100

177 S(N0,1) STAR FLUX (F.U.) @ STANDARD FREQ
178 T(N0, 1) STAR/SOLAR NAME
179 S(N0,3) STAR=N. DEC. (deg); SOLAR=N. DEC. @ 0 GMT (deg)

180 S(N0,2) STAR=RT ASC (deg); SOLAR=GHA @ 0 gmt (deg)
181 T(N0,18)* STD FREQ(GHz) * 100
182 N( 9&10,1) STORE STRING P$

183 T( 9, 1) STORE STRING P$
184 N( 1, 4) SYSTEM # + (DATA REVISION #/100)
185 M(N8, 3)d T/Ta CSC COEFF (B6)

186 M(N8, 2)d T/Ta ZENITH (b5)
187 A( 8)rw T/Ta*10^4
188 M(N8, 5)d TEMPERATURE,F (A(3)/10)

189 D(T6, 4)* TIME OF PREDICTED STAR MAX: E1*1000
190 M(N8, 4)d TIME, DECIMAL HRS (FNT2)
191 D(4,N3+2)x TIME,hrs(E1)*10^3

192 D( 4, 2)x TRX PWR: LGT(E4)*10^4
193 A( 9)* U*10^4: REFERENCE PWR
194 M(N8, 7)d WATER DENSITY (L7)

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NBS2.00 <NBS 9915, 0007> T6 & D5-F10

REVISION # 9

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MATRIX LIST # 9  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

195 M(N8, 7)\* Y-factor

## 7.6 FUNCTION LIST ALPHABETICAL BY MEANING

NBS2.00 <NBS 9915, 0007> T6 & D5-F10

RLVISION # 10

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1L.02, NBS1C.01, NBS1D.02

1	FNX107	+12 volts, RF UNIT: channel #4 = 110 1011
2	FNX108	+20 volts, RF UNIT: channel #3 = 110 1100
3	FNX 27	0.100000 V DVM RANGE
4	FNX 28	1.00000 V DVM RANGE
5	FNX 29	10.0000 V DVM RANGE
6	FNX 30	100.000 V DVM RANGE
7	FNX 31	1000.00 V DVM RANGE
8	FLAG 1	1=EIPR DATA INPUT
9	FNFG 8	AS= !.....!.....!.....!.....!.....!.....!.....!
10	FNX 36	AC VOLTS (not installed)
11	FNQ(Q)	ANS ROUTINE SEQUENCE
12	FNN(Q)	ANSWER ROUTINE:DISPLAYS Q, SPACE = NO CHANGE
13	FNA(N0)	ANT POINT:N0=STAR # IN:H,L1,B1,E1; OUT:A,L,L0 <NBS7411,7449,8339>
14	FNFe 0	ATTN SETTING, FILTER IDENTIFICATION HEADING
15	FNb(Q)	BEEP: Q=# OF BEEPS
16	FNFG 4	BEST FIT 5 CUTS
17	read SW Y	LIAND(ROT(REYTE4,Y)1)=1 IF SWITCH Y IS UP
18	KLYb 8	CALC:STAR FLUX @ f
19	KEYc 16	CHANGE # PTS IN PARABOLIC FIT ROUTINE
20	KLYc 5	CHANGE BIAS:HR ANG, DLCL, Az, ELEV
21	KEYc 15	CHANGE FREQ & calc new STAR FLUX
22	KEYc 18	CHANCL NOISE ADD SOURCES (C3):0=#1&#2,1=#1,2=#2,3=PRR(mw)
23	KLYa 1	CHANCL PRGM CONST & MODIFY CORRESPONDING N(I,J)
24	KLYc 9	CHANCL STD attn(C2):0=OUT when noise add ON, 1=IN
25	KEYc 17	CHANGEL: G/TA(dB)
26	KLYc 8	CHANGE: T(syst)/Ta
27	KEYc 7	CHANGEL: TA = ADDED NOISE,K
28	KEYc 6	CHANGE:input ATTN (dB), FILTER #
29	KEYe 3	CHECK CHANNEL VOLTAGES
30	KEYe 2	CHECK DVM
31	KLYe 1	CHECK LIST
32	KLYe 6	CHECK NOISE ADD STABILITY
33	KLYe 4	CHECK PRGM ATTENUATORS
34	KEYe 5	CHK PRR,TYPELIV & ATTN STABILITY
35	FNX105	CRYSTAL DIODE voltage: channel #6 = 110 1001
36	FNQ(Q)	CURVE FIT:0=INIT,-99=CALC FIT (cut:I,K2,W1,V5,G(I,J),Y(I))
37	FNX106	L/A OUTPUT: channel #5 = 110 1010
38	FNX104	L/A REFERENCE voltage: channel #7 = 110 1000
39	FNX 32	DC FILTER OUT
40	FNX 33	DC FILTER IN
41	FNX109	DEW POINT: channel #2 = 110 1101
42	FLAG 1	DISK STORAGE (F7) <prgm A>



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FUNCTION, KEY, & FLAC LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

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43 FNI(Q)      DRAW LINE:1 -;2 --;3 ==;4 ##;5 @@
44 FNT(Q)      DUMMY USED IN ERROR PRT OUT IN DW63B

45 FNX 24      DVM AUTORANGE
46 KEYc 2      LIRP:START @ SET ?
47 KEYc 3      ENTLI TLMP,A(3);AND DEL PT ,A(4) USED IN REWORK

48 read DVM    ENTER(2,*)A,B: A=FUNCTION, B=VOLTAGE
49 read CLOCK  LNTLR(3,*)C,D:C=#1 THUMB SW,D=SW #2 #3 #4 HHMM.SS
50 FNL(N0)     ERROR CALC FOR G/T: N0=STAR #

51 FNVd 7      FIT #1 OF 5 CUTS
52 FNVd 8      FIT #2 OF 5 CUTS
53 FNVd 2      FIT X=EXP(V*(V2-W1)^2)

54 FLAG 2      G/T LPROPS CALCULATED FOR SPECIFIC FREQ & DATE
55 FNL 1.1     G/T err TABLE: no print variables
56 FNL 1.2     G/T err TABLE: print variables

57 FNL 1       G/T plot (J=19)
58 FNL 2.1     G/Ta err TABLE: no print variables
59 FNL 2.2     G/Ta err TABLE: print variables

60 FNL 2       G/Ta plot (J=20)
61 FNX111     CHOOSE DVM: channel #0 = 110 1111
62 FLAG 9      HEADINC:1=BYPASS DATE,FREQ,ATN LIAN,C,G/T,C/Ta

63 FNI(Q)      READINGS: 0=FIT #, 1=TAPE #
64 FNL 3       HPEW#1 plot (J=21)
65 FNL 4       HPEW#2 plot (J=22)

66 FNI(Q)      INIT HARDWARE: 0=VTVM,BRC,NOISE @ NOMINAL, 1=INIT PWR BRG
67 FNX100     J357 INPUT(e.g. ext pwr meter):channel #11 = 110 0100
68 FNI(N0)     K-FACTOR CALC,e.g. K1,K2,...,K9

69 FNI(Q)      KEY SUB: Q=KEY #, SEE KEY LIST
70 KEYc 19     LAST MEASUREMENT:initiates storage steps
71 KEYa 2      LINT: 1=SITL PREP, 2=MEAS, 3=REWORK

72 KEYc 14     LIST CURRENT DATA MAT D
73 KEYc 13     LIST G/T SUMMARY
74 FNI(Q)      METEOROLOGICAL INFO:0=INPUT DATA,1=PRT DATA,2=SELECT MAN/AUTO

75 FNX 76     NO RF to BOLOMETER (avoid - use FNX68)
76 FNL 7       NEt plot (J=25)
77 FNX 68     NO RF TO BOLOMETER

78 FNX 64     NO RF to BOLOMETER & STD PAD IN
79 FNX 72     NO RF to BOLOMETER & STD PAD IN (avoid-USE FNX64)
80 FNX 80     NOISE ADD #1 & #2 ON

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1E.02, NBS1C.01, NBS1D.02

81	FNX 81	NOISE ADD #1 & #2 OFF
82	FNX 82	NOISE ADD #1 ON
83	FNX 83	NOISE ADD #1 OFF
84	FNX 84	NOISE ADD #2 ON
85	FNX 85	NOISE ADD #2 OFF
86	FNX 88	NOISE ADD #1 & #2 ON (avoid - use FNX80)
87	FNX 89	NOISE ADD #1 & #2 OFF (avoid - use FNX81)
88	FNX 90	NOISE ADD #1 ON (avoid - use FNX82)
89	FNX 91	NOISE ADD #1 OFF (avoid - use FNX83)
90	FNX 92	NOISE ADD #2 ON (avoid - use FNX84)
91	FNX 93	NOISE ADD #2 OFF (avoid - use FNX85)
92	FNX 8	NUR plot (J=26)
93	FNX 40	CHRS (not installed)
94	FNX 96	OPENS MULTIPLEXER so can use front panel inputs
95	FNX 97	OPENS MULTIPLEXER so can use front panel inputs
96	FNX 96	OPENS MULTIPLEXER so can use front panel inputs
97	FNX 99	OPENS MULTIPLEXER so can use front panel inputs
98	FNQ(Q)	PAGE HEADING: Q=# SPACLS BEFORE PRT HEADING
99	FNQ(Q)	PLOT DATA: 1=PRT HEADING
100	FNX 40	PRGM ATTN =15dB
101	FNX 49	PRGM ATTN =14dB
102	FNX 50	PRGM ATTN =13dB
103	FNX 51	PRGM ATTN =12dB
104	FNX 52	PRGM ATTN =11dB
105	FNX 53	PRGM ATTN =10dB
106	FNX 54	PRGM ATTN = 9dB
107	FNX 55	PRGM ATTN = 8dB
108	FNX 56	PRGM ATTN = 7dB
109	FNX 57	PRGM ATTN = 6dB
110	FNX 58	PRGM ATTN = 5dB
111	FNX 59	PRGM ATTN = 4dB
112	FNX 60	PRGM ATTN = 3dB
113	FNX 61	PRGM ATTN = 2dB
114	FNX 62	PRGM ATTN = 1dB
115	FNX 63	PRGM ATTN = 0dB
116	FNQ(Q)	PRGM const(MAT N):1=LIST,2=correct,3=N(I,J) to variables
117	FLAG 7	PRT OUT LFR:1=W/O CONSTS
118	KEYb 12	PRT: ELEV vs GMT

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FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

119	KEYb 11	PRT:LIST OF ALTERATL STAR ERK
120	KLYb 7	PRT:SITE & FLUX DATA
121	KEYb 9	PRT:TYPICAL G/T VALUES AND ERRORS
122	FNX103	PWR BRDG OUTPUT: channel #8 = 110 0110
123	FNf(Q)	PWR MEAS:0=#1&#2,1=#1,2=#2,3=PWR,mw (IN: A3,C2,E2,V,FND1)
124	FNu(Q)	PWR RATIO CHECK: IN:C2,L2,C3 OUT:A(7),A(8)
125	FNX101	PWR BRDG vs FINE REF: channel #10 = 110 0101
126	FNX102	PWR BRDG vs REF VOLT, set fine volt:ch #9 = 110 0110
127	FNvd 5	Q=FNf2 & RETURN
128	FNX 34	RATIO: FILTER IN
129	read SW	RBYTE 4=INTEGER SUM OF BINARY SWITCHES
130	FNf(Q)	FEAD(ENTER DATA) DEVICE:2=DVM,3=CLOCK,4=BREAK SWITCHS
131	KEYc 3	RLFIT 5 CUTS: USED AFTER ONE OF THE CUTS IS RETAKEL
132	FNFd 0	RESTART
133	FNvd 0	RESTART
134	KEYa 0	RESTART
135	KLYd 1	RESTART @ N=?
136	KEYb 0	RESTART:0=RESTART,1=LINKMEAS,2=REWORK,3=KEY LIST
137	KLYe 0	RESTART:0=KEY LIST,1=AUTO CK,2=NO AUTO(F2=0)
138	KLYc 0	RESTART:0REWORK,1LOAD,2AUTO SEQ,3DLL,4G/T,5FIT,6PLT,7ERR
139	KEYc 0	RLSTART:1SKY,2G/T,3EIRF,4LNK,5NLW TAPE,0MASTER RESTART
140	FNFa 1	REWIND INT CASSLTTE
141	FNX 69	RF TO BOLOMETER
142	FNX 65	RF to BOLOMETER & STD PAD OUT
143	FNX 73	RF to BOLOMETER & STD pad OUT (avoid-USE FNX65)
144	FNX 77	RF to BOLOMETER (avoid - use FNX69)
145	FNFc 0	SLE# CHANGE
146	FNfb 0	SITE: W. long, N. lat, alt
147	KEYd 5	SORT,FIT and LIST DATA
148	FNFc 1	SOURCE# CHANGE, RESET MAT A & MAT D
149	FNS(Q)	SPACE PAGL Q SPACES
150	KLYc 4	STAR FIX:routine to estab ANT BIAS
151	FLAG 1	STAR FLUX CALC FOR SPECIFIED FREQ & DATE
152	KEYc 1	STAR:RESTART @ N
153	FNX 66	STD ATTN IN
154	FNX 74	STD ATTN IN (avoid - use FNX66)
155	FNX 67	STD ATTN OUT
156	FNX 75	STD attn OUT (avoid - use FNX67)

-5-

FUNCTION, KEY, & FLAG LIST # 10  
for NBS1X.02, NBS1A.01, NBS1B.02, NBS1C.01, NBS1D.02

157	FNVD 12	STORE MAT M & MAT N
158	KEYC 10	STORE CUTS TAKEN
159	KEYC 11	STORE INT: MAT N, S, T and PRGM
160	KEYD 7	STORE MAT M & MAT N
161	KEYB 10	STORE: S, T, N
162	KLYC 12	STORE: MAT N (summary data), N (prgm consts) on ext CAS/DISK
163	FNX110	TEMP (F/100): channel #1 = 110 1110
164	FNT(Q)	TIME, DECIMAL HRS: 1=SET UP E1 (IN: L3, E5, N4)
165	KEYB 2	UPDATE: FREQ, BW, ANT PARAMETERS
166	KEYB 13	UPDATE: N(I, J)
167	KLYB 3	UPDATE: ANT POINTING ERROR
168	KEYE 1	UPDATE: RUN#, DATE, SITE
169	KEYB 6	UPDATE: SUN/MOON ALMINAC DATA
170	KEYE 4	UPDATE: T, G/T, Ta, PWR RESP
171	KEYE 5	UPDATE: TEMP, DEW PT
172	FNW(Q)	VOLTAGE RLADING: volt range + channel #/100
173	FNW(Q)	WAIT Q MILLISEC
174	FNZ(N0)	$X_i = FNK(N0) * C1 * S(N0, 4) * 1E-26$
175	FNL 6	Y-factor plot (J=24)
176	FNVC 13	calc E, B0, B2, G via B2, G-diff=C7, Ta=H9, B9
177	FNVD 9	calc Ta via G at zenith = $B2 * (D * F / 0.313)^2, B2$
178	FNTG(L)	calc: AW1 HPBW #1 (min of arc)
179	FNVD 1	calc: G/T, G/Ta, NEF, NUF errors
180	FNVD 3	calc: GRAPH RANGES for AUTO SEQ
181	FNVD 4	calc: LINLAR & CSC FIT PARAMETERS
182	KEYD 2	calc: STAR FLUX VALUUS, Ta, eff area
183	FNFD 5	heading *HPBW #1 = ... + ... CSC L = ... (ant HPBW = ...)
184	FNFD 2	heading G/T, G/Ta, NEF, NUF, Y-factor
185	FNFD 3	heading K1, ... K9, K.A-eff, R-eff, S, Xi
186	FNFD 6	heading: G(dB) G-diff T(K) Ta(K) Y-fac HPBWerr data fit c(1-K2) ....
187	FNVD 11	load PIOR SUMMARY MAT M, MAT N
188	FNFD 10	prt A2, C9, D1, N(21, 1), T(1, 9), C8, D8, D9, J1, N(21, 3), T(1, 11), C2
189	FNFD 9	prt K1, K2, K3, K6, K8, K9, K, A-eff, R-eff, S, Xi
190	KEYD 4	prt: G/T DATA SUMMARY with page heading
191	KEYD 6	prt: G/T DATA SUMMARY (no heading)
192	FNFD 1	ques DATA ON TAPE/DISK, TAPE #
193	FNFD 7	ques: DATA SET#
194	KEYE 9	ques: NEW FREQ, BW, INPUT ATTN, SIML STAR NOISE
195	FNVD 6	read: RWRK#, SET, F, T/Ta@90, csc, HPBW@90, csc, Ta
196	FNVD 10	set FLAG t8 if RWRK# not integer

## 8. COMPUTER PROGRAM LISTINGS

In this section, the flow diagram for the computer program is printed followed by a listing of the program. Following the program listing is a cross reference list of the program constants and of all the line numbers where these constants occur. The meanings of the program constants are given in section 7.

The numbers circled on the flow diagrams are the "R" numbers. For example, 405 corresponds to the location in the computer program of the line where  $R = 405$  occurs. The purpose for the R numbers is to label program segments in the computer listings; and, in the case of a hardware or a software hangup, to be able to identify which part of the program was being executed at the time of the hangup. To obtain this identity, the current value of R is examined using the computer keyboard command R, "EXECUTE."

## 8.1 X - SUBROUTINES

```

50 Q1="X.68 D1-4 T. 1
60 GOTO 3900
70 DEF FNX(Q)
80 FORMAT B
90 WRITE (4,80)NBYTES
100 WAIT 100
110 RETURN 0
120 DEF FNR(Q)
122 IF Q=4 THEN 142
124 WAIT 40
130 ENTER (Q+1)*Q1*Q
140 RETURN 0
142 RETURN REYTE4
150 DEF FND(Q)
160 IF Q THEN 180
170 RETURN FNX68+FNX67+FNX127+FNX101+FNX103
180 Q=FNX68+FNX28+FNX103+FNX46+FNX27+FNX2
190 V=FNX68+FNX29+FNX103+FNX55+FNX2+FNX111+FNX27+FNX100
200 RETURN 0
210 DEF FNP(Q)
220 IF E2 >= 0 THEN 240
230 E2=0
240 IF E2<16 THEN 260
250 E2=15
260 IF Q>2 THEN 440
270 V7=FNX67+FNX68+FNX103+FNX101+FNX103+FNX101+FNX27+FNX46+FNX2
280 V8=FNX69+FNX460+FNX2
290 V9=FNX(67-Q2)+FNX(68+2+Q)+V7+FNX(68+FNX2
300 V8=FNX(81+2*Q)+FNX67+FNX460+V7+V9+FNX2)/2
310 IF ABS(V7+V8+V9)>1E+70 THEN 460
320 Q1=V8*(2+V-V8)
330 Q2=V9*(2+V-V9)
340 Q3=(1-Q2+Q2+Q3)*Q2
350 IF Q1>0.096 OR Q2>0.096 THEN 370
360 E2=E2-1
370 IF Q1<0.132 AND Q2<0.132 THEN 390
380 E2=E2+1
390 RETURN Q1*(Q3-Q1)
400 PRINT "PEZERO"
410 E2=E2+1
420 Q1=FNX(68-E2)+FNX68+FNX1
430 GOTO 220
440 V7=FNX68+FNX101+FNX127+FNX460+FNX2
450 V8=FNX69+FNX460+FNX2
460 V9=FNX68+FNX460+FNX2
470 V=FNX103+FNX29+FNX460+Q7
480 IF ABS(V7+V8+V9)>1E+70 THEN 460
490 Q1=(V7+V9)/2-V8
500 RETURN Q1*(2+V-Q1)*Q

```



## X - SUBROUTINES (cont)

```

510 DEF FNA(N0)
520 E9=24/360*DOSSIN(N0)
540 E9=(E1+H-E8)/24+L1/60
550 IF T(N0,21)=0 THEN 580
560 E=SIN(N0,21)*(E1+H)+T(N0,11)/10+E9
570 GOTO 650
580 E9=E9+O8*24/360
590 IF E9 >= 24.0657056 THEN 610
600 GOTO 630
610 E9=E9-24
620 GOTO 590
630 E9=E9+360/24
640 E=E9+360-SIN(N0,21)-O4
650 IF E >= 360 THEN 670
660 GOTO 690
670 E=E-360
680 GOTO 650
690 O=SIN(N0,3)+T(N0,21)*E1+T(N0,11)/1000*L1+B1
700 L=SIN(O5*SIN(O+COS(O5-COS(O+O8E
710 L=ATH(L/SQR(1-L*L+1E-99)
720 A=SIN(O/COS(O5-COS(L-TAN(O5+THL
730 A=ATH(SQR(1-A*A)/(A+1E-99))+O+ATH1E+99*(A/O)
740 IF E <= -180 THEN 780
750 IF E <= 0 THEN 820
760 IF E <= 180 THEN 780
770 GOTO 790
780 A=360-A
790 IF T(N0,21)=0 THEN 820
800 O=T(N0,13)/1000
810 L=L-ATH(COS(L*SIN(O/(1-SIN(L-SIN(O
820 O=L-O=L
840 FOR I=1 TO 4
850 O0=(L8/TAN(O-L9/(TAN(O12)/60
860 O=O0+L
870 NEXT I
880 L=O
890 RETURN A
900 DEF FNB(O)
910 FOR I=1 TO O
920 BEEP
930 WAIT ABS(100*(I-4))
940 NEXT I
950 RETURN O
960 DEF FNN(O)
970 DISP "(=NO):";O;
980 INPUT B$
990 IF B$(1,1)="" THEN 1010
1000 RETURN VAL(B$)
1010 RETURN O
1020 DEF FNI(O)
1030 A$=" - - - - - ==###@#@#@#"
1040 A$=A$[4*O-3,4*O]
1050 A$[5]=A$
1060 A$[9]=A$
1070 FORMAT F5.1
1080 WRITE (15,1070)A$;A$;A$;A$;A$;A$
1090 RETURN O

```

## X - SUBROUTINES (cont)

## X - SUBROUTINES (cont)

# X - SUBROUTINES (cont)

X#	50	1600									
FNX	70 190 290	170 190 300	200 190 300	170 370 420	170 270 440	170 70 440	180 270 440	180 270 450	180 270 460	190 280 470	190 290 470
O	70 260 820 1040 1390 1590	90 270 850 1040 1430 1700	120 290 850 1130 1440 1790	120 300 860 1130 1470 1800	130 320 900 1100 1490 1800	130 700 900 1170 1490 1800	140 700 910 1170 1510 1800	150 720 960 1180 1520 1800	160 800 970 1190 1580 1800	180 810 1010 1310 1580 1800	210 810 1020 1380 1580 1800
FNR	120 470	180 1510	180	190	270	280	290	300	440	450	460
Q1	130 1580	320	350	370	390	390	420	490	500	500	1550
FND	150	420	420								
FNW	180 1430	190	190	270	280	290	300	440	450	460	470
V	190	320	330	470	500						
FNP	210										
E2	220 420	230	240	250	270	360	360	380	380	410	410
V7	270	290	300	310	440	480	490				
V8	280	300	300	310	320	320	450	480	490		
V9	290	310	330	330	460	480	490				
C2	290	340	340								
Q2	320 1210	340 1240	350 1270	370 1280	1140 1290	1150 1290	1160 1370	1170 1400	1190	1190	1200
Q3	340	390									
R3	340										
FNR	510										
N0	510 1100	530 1280	550 1460	560 1460	560 1460	640	690	690	690	790	800
E8	530	540									
SL 1	530	560	640	690	1460						
E9	540	580	580	590	610	610	630	630	640		
E1	540	560	690								
H	540	560									
TL 1	550	560	690	690	790	800	1280				
E	560	640	650	670	670	700	740	750	760		

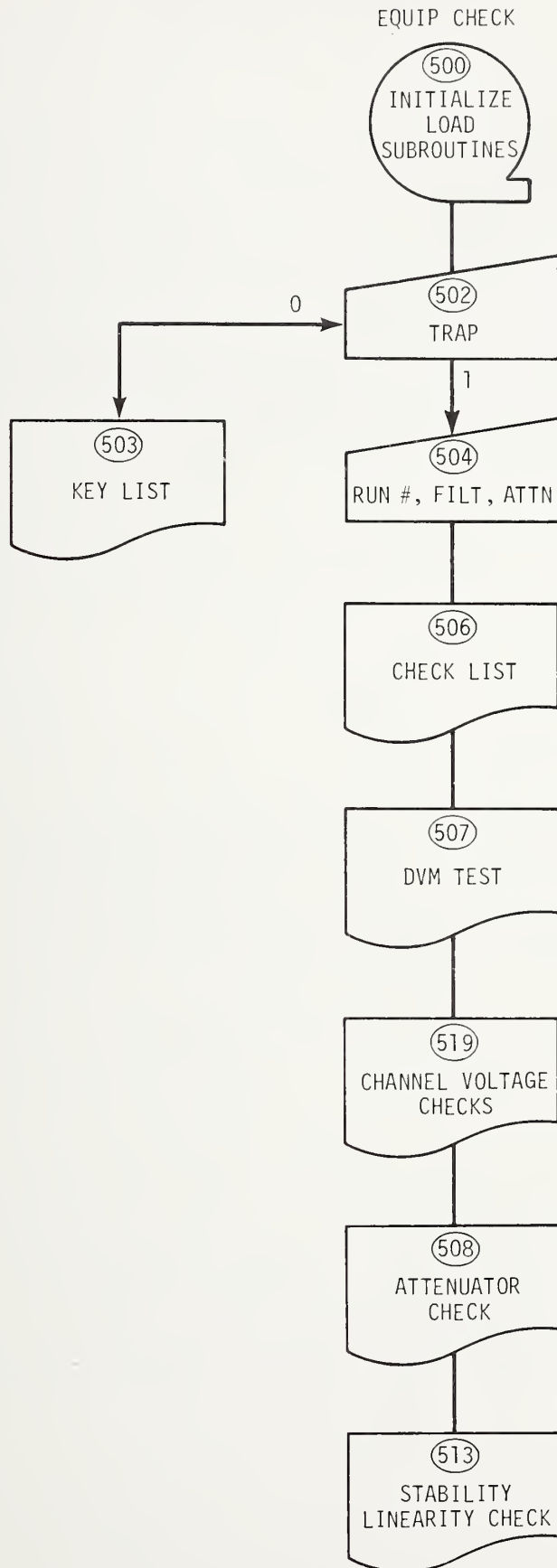
# X - SUBROUTINES (cont)

G4	560	640									
G6	580										
L1	690										
B1	690										
L	700	710	720	730	740	750	760	770	780	790	800
	820	860	870	880	890	900	910	920	930	940	950
CE	700	700									
R	700	720	730	740	750	760	770	780	790	800	
L0	820										
I	840	870	880	890	900	910	920	930	940	950	
00	850	860									
L8	850	1240	1250								
L9	850	1250	1260								
FNB	980										
FRH	960										
B#	960	990	1000								
FN1	1020										
R#	1330	1040	1040	1050	1060	1070	1080	1090	1100	1110	1120
	1080										
FR0	1100	1460									
LT	1120	1180	1190	1200	1210	1220	1230	1240			
RLD	1120	1120	1140								
F	1130	1130	1130	1140	1150	1160	1170	1180	1190	1200	
G4	1150	1230									
00	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	
L4	1170	1230									
G5	1190	1230									
L5	1200	1230									
G6	1210	1230									
L6	1220	1230									
D1	1240	1260									
R1	1240	1270	1280								
B4	1270										
E	1280										

# X - SUBROUTINES (cont)

K2	1290	1410			
K3	1300	1410			
K	1310				
K4	1320	1410			
K5	1330	1410			
K6	1340	1410			
K7	1350	1410			
J1	1360	1370			
K8	1370	1410			
S	1390	1400			
K9	1400	1410			
K	1410	1420			
FHZ	1460				
C1	1460				
FHC	1470				
H5	1480	1480	1540		
FHS	1490	1790			
H3	1600				
HC1	1640				
H6	1640				
P3	1680	1680	1700	1700	1700
C	1710				
D	1730				
G	1760	1760			
H9	1760				
T	1760				







# E - EQUIP CHECK (cont)

```

4350 R=504
4370 DISP "RUN #":
4380 N6=FNB3+FNHN6
4390 DISP "FILTER FRL: N6":
4400 C8=FNHC8
4405 A3=10*(NC13+.5+(C8-.49)*.01)
4407 A8=NC18+.5+(C8*.49+.5)
4410 DISP "FILTER BANDPASS/WH:":
4420 C9=FNHC9
4430 DISP "INPUT ATTEN:DB:":
4440 E6=FNNE6
4450 DISP "SIMUL STAR NOISE:DB:":
4460 H=FNHH+FNH3
4464 RETURN 0
4466 R=504.1
4467 F2=1
4468 DISP "DO CHECK LIST & DVM (5-ND)":
4469 INPUT 0
4470 IF 0=0 THEN 4478
4476 Q=FNJ1+FNH6+FNJ2
4478 Q=FNH4+FNJ3+FNH9+FNJ4+FNJ5.1+FNH6+FNJ5+FNJ6+FNJ8
4480 DISP "CONNECT EARTH TERM:SET PWR LEVEL":
4490 Q=FNB3+FNH1
4500 Q=FNH5+FNJ6.1
4510 STOP
4530 R=506
4540 DISP "PRINT ALL ON":
4550 INPUT A$
4560 PRINT "8 AC PWR SWITCHES ON":
4570 INPUT A$
4580 PRINT "DANA: EXT RATE FULL CW":
4590 INPUT A$
4600 PRINT "DANA: DATA OUTPUT BUTTON IN":
4610 INPUT A$
4620 PRINT "DANA: PROGRAM CONTROL BUTTON IN":
4630 INPUT A$
4640 PRINT "RF UNIT: BANDPASS/FREQ @ 5.3Mhz/70MHz":
4650 INPUT A$
4655 E6=INT(ABSNC1.7)
4660 PRINT "RF UNIT: ATTEN SET TO":E6:"dB":
4670 INPUT A$
4672 PRINT "RF UNIT: SIM STAR NOISE @ 3.5'dB":
4674 INPUT A$
4680 PRINT "RF UNIT: METER RANGE 'X1'":
4690 INPUT A$
4700 PRINT "NOISE SOURCE CONNECTED TO RF INPUT":
4710 INPUT A$
4712 Q=FNH0
4720 PRINT "RF UNIT: OUTPUT METER @ ":(10*SGHNC1.7)-(ABSNC1.7)-E6:" dB ":
4730 INPUT A$
4740 PRINT "CLOCK UNIT: SET DATE":
4750 INPUT A$
4760 PRINT "CLOCK UNIT: SET GMT TIME":
4770 INPUT A$
4780 DISP "END"
4790 PRINT
4800 PRINT
4810 RETURN 0
4820 STOP

```

# E - EQUIP CHECK (cont)

```

4830 R=507
4840 P#C131="KEY 3:  CHECK ATTENUATORS"
4850 Q=FNC4+FNH0+FNH1+FNH2
4860 PRINT "DVM FUNCTION 1110: FILTER 7H";
4870 INPUT A#
4880 Q=FNH33
4890 PRINT "DVM FUNCTION 1110: FILTER 7H";
4900 INPUT A#
4910 FOR I=0 TO 4
4920 PRINT 10*(3-I); "VOLT RANGE"*(FNH1/I)*"RANGE #";I;"DEC PLACES";1+2
4930 PRINT
4940 INPUT A#
4950 NEXT I
4960 PRINT "  AUTO-VOLT RANGE"*(FNH1/I)*"RANGE #";I
4970 FOR I=1 TO 5
4980 PRINT
4990 NEXT I
5000 DISP "END";
5010 RETURN 0
5020 R=506
5030 P#C131="KEY 4:  CHECK ATTENUATORS"
5040 Q=FNH0
5050 F3=1
5060 N=3
5070 C2=1
5080 R=509
5090 IF F3 THEN 5130
5100 DISP "0=XTAL, 1=Type 17, 2=IDG 17"
5110 F3=FNC4+FNH1+FNH2
5120 DISP "# REPEAT PW: NEW: YES";
5130 N=FNH2+FNH3

```

## E - EQUIP CHECK (cont)

```

5180 R=513
5190 GOSUB 5620
5200 P0=P
5210 Q=FN13+FN52+FN64+FN11
5220 IF P3 THEN 5260
5230 FORMAT 3%,"CRYSTAL FREQUENCY (KHZ) = (F6.3," A",2),("C",F3.0," DEAS")
5240 WRITE (15,5230)P0,S,N
5250 GOTO 5280
5260 FORMAT 3%,"NBS TYPE IV OUTPUT"("F1.5," MM +("F6.3," A",2),("C",F3.0," DEAS")
5270 WRITE (15,5260)P0,S,N
5280 GOSUB 5800
5290 FORMAT 3%,"STD CK:"(F6.3," DB")
5300 WRITE (15,5290)Q
5310 PRINT
5320 PRINT
5330 PRINT "X ATTN      PRGM ATTN #1      #1 PWR OR VOLT      ORIG PWR/#1 PWR"
5340 PRINT "      #1 PWR/#2 PWR"
5350 PRINT "      PRGM ATTN #2      #2 PWR OR VOLT      STD CK @ #2      "
5360 PRINT "      NOMINAL #1/#2"
5370 PRINT
5380 PRINT
5390 FOR A1=0 TO 8
5400 IF F2=0 THEN 5420
5410 IF A1 THEN 5590
5420 IF A1=3 OR A1=5 OR A1=7 THEN 5590
5430 FOR A2=1 TO 15
5440 Q=FNX(63-A1)
5450 GOSUB 5620
5460 P1=P
5470 S1=S
5480 Q=FNX(63-A2)
5490 GOSUB 5620
5500 P2=P
5510 S2=S
5520 GOSUB 5800
5530 FORMAT F3.0," DB" (F1.0," DB" (F1.5," +("F5.2," A",F10.3," DB" (F13.0," DB"
5540 WRITE (15,5530)F6,A1,P1,S1,10*LOG(F0/P1)+10*LOG(P1/F2)
5550 FORMAT F13.0," DB" (F13.0," -("F5.2," A",F10.3," DB" (F11.0," DB"
5560 WRITE (15,5550)A2,P2,S2,Q,A2-A1
5570 PRINT
5580 NEXT A2
5590 NEXT A1
5600 Q=FN58
5610 RETURN Q
5620 R=511
5630 REM *****PWR: F3=0 FOR WNL DEL, F3=1 FOR NBS TYPE IV ***
5640 S=M=V1=0
5650 IF F3=0 THEN 5670
5660 Q=FN51
5670 FOR I=1 TO N
5680 IF F3 THEN 5720
5690 WAIT 50
5700 P5=FN4(4.05)
5710 GOTO 5730
5720 P5=FN43
5730 N=N+P5
5740 V1=V1+P5*P5
5750 NEXT I
5760 P=N/N
5770 IF N=1 THEN 5790
5780 S=10*LOG(CV1/N-P1/P)+10*LOG(P1/P)
5790 RETURN

```

# E - EQUIP CHECK (cont)

```

5800 R=512
5810 REN +---+ DB CREF: 0.000 IN: 0.001 DB = 0
5820 Z=P
5830 Q=FNN66
5840 GOSUB 5650
5850 Q=FNN75-10*LG(FU/2+0.100)GTL1-A3+
5860 RETURN
5870 R=513
5880 P#0131="KEY 5: CHECK PARALINEARLY STAB OF TYPE IV"
5882 P8=10*(Q-INTQ)
5890 Q3=3
5900 T1=FNP3
5910 Q=FND0+FND1
5920 F1=F5=2
5930 F7=1
5940 F6=12
5950 IS=0.01
5960 N3=3
5962 A1=0
5964 A2=1
5970 IF F3=0 THEN 6000
5975 F1=F5=0
5990 R=514
6000 IF P2 THEN 6480
6010 DISP "0=PPT PARV'S; 2=GRAPH FWR RATIO";
6020 F1=FNB3+FNNF1
6030 IF F1=0 THEN 6210
6040 DISP "PRW LEVEL:0=CONST,1=STEPPED";
6050 F7=FNNF7
6060 IF F7=0 THEN 6090
6070 F6=1
6080 GOTO 6110
6090 DISP "MEAS:0=PRGM ATTN,1=STD ATTN";
6100 F6=FNNF6
6110 A1=0
6120 A2=1
6130 IF F6 THEN 6170
6140 DISP "#1 LEVEL, #2 LEVEL (PRGM ATTN)";
6150 INPUT A1,A2
6160 GOTO 6180
6170 F6=12
6180 DISP "# OF MEAS/PLT";
6190 N3=FNNN3
6200 DISP "SMALLEST GRAPH UNIT (DB)";
6210 IS=FNNI5

```



# E - EQUIP CHECK (cont)

```

6230 REM BYPASS NOISE (DB OF 10)
6230 Q0=0
6240 GOTO 6270
6250 DISP "FNR VIA NO. 1 (0) FNR0 = F0 :
6260 Q0=FNR0
6270 Q2=0
6280 F3=F1+Q0
6290 IF Q0=0 THEN 6340
6300 DISP "ADD SOURCE:0-110MHz*10=11*10=110 :
6310 Q3=FNR03
6320 DISP "INSERT 2DB WASH N/2 0 (0) FNR1=100 :
6330 Q3=FNR03
6340 T0=0
6350 DISP "INPUT ATTN (DB) :
6360 E6=FNR05
6370 IF F1=3 THEN 6420
6380 DISP "SIMULATED STAR NOISE LEVEL (DB) :
6390 H=FNR04
6400 FIXED 4
6405 DISP "STD/110+LGTR3 (DB) :
6410 R3=ND1.30=FNR03
6415 STANDARD
6420 DISP "IF FREQ (MHz) :
6430 Q8=FNR08
6440 DISP "BANDWIDTH (MHz) :
6450 Q9=FNR09
6460 R=515
6470 Q=FNR02+FNR00+FNR03
6480 IF F5>1 THEN 6680
6550 FORMAT " NO. BRDG " /7 V8 V9 PWR(MW)
6560 WRITE (15,6550) " 1) ERR " "SIGNA"
6570 PRINT
6580 Q=FNR01
6590 M1=N2=N=N1=N2=P3=V1=V2=V3=V4=V5=V6=V7=V8=V9=V10=V11=V12=V13=V14=V15=V16=V17=V18=V19=V20=V21=V22=V23=V24=V25=V26=V27=V28=V29=V30=V31=V32=V33=V34=V35=V36=V37=V38=V39=V40=V41=V42=V43=V44=V45=V46=V47=V48=V49=V50=V51=V52=V53=V54=V55=V56=V57=V58=V59=V60=V61=V62=V63=V64=V65=V66=V67=V68=V69=V70=V71=V72=V73=V74=V75=V76=V77=V78=V79=V80=V81=V82=V83=V84=V85=V86=V87=V88=V89=V90=V91=V92=V93=V94=V95=V96=V97=V98=V99=V100=V101=V102=V103=V104=V105=V106=V107=V108=V109=V110=V111=V112=V113=V114=V115=V116=V117=V118=V119=V120=V121=V122=V123=V124=V125=V126=V127=V128=V129=V130=V131=V132=V133=V134=V135=V136=V137=V138=V139=V140=V141=V142=V143=V144=V145=V146=V147=V148=V149=V150=V151=V152=V153=V154=V155=V156=V157=V158=V159=V160=V161=V162=V163=V164=V165=V166=V167=V168=V169=V170=V171=V172=V173=V174=V175=V176=V177=V178=V179=V180=V181=V182=V183=V184=V185=V186=V187=V188=V189=V190=V191=V192=V193=V194=V195=V196=V197=V198=V199=V200=V201=V202=V203=V204=V205=V206=V207=V208=V209=V210=V211=V212=V213=V214=V215=V216=V217=V218=V219=V220=V221=V222=V223=V224=V225=V226=V227=V228=V229=V230=V231=V232=V233=V234=V235=V236=V237=V238=V239=V240=V241=V242=V243=V244=V245=V246=V247=V248=V249=V250=V251=V252=V253=V254=V255=V256=V257=V258=V259=V260=V261=V262=V263=V264=V265=V266=V267=V268=V269=V270=V271=V272=V273=V274=V275=V276=V277=V278=V279=V280=V281=V282=V283=V284=V285=V286=V287=V288=V289=V290=V291=V292=V293=V294=V295=V296=V297=V298=V299=V300=V301=V302=V303=V304=V305=V306=V307=V308=V309=V310=V311=V312=V313=V314=V315=V316=V317=V318=V319=V320=V321=V322=V323=V324=V325=V326=V327=V328=V329=V330=V331=V332=V333=V334=V335=V336=V337=V338=V339=V340=V341=V342=V343=V344=V345=V346=V347=V348=V349=V350=V351=V352=V353=V354=V355=V356=V357=V358=V359=V360=V361=V362=V363=V364=V365=V366=V367=V368=V369=V370=V371=V372=V373=V374=V375=V376=V377=V378=V379=V380=V381=V382=V383=V384=V385=V386=V387=V388=V389=V390=V391=V392=V393=V394=V395=V396=V397=V398=V399=V400=V401=V402=V403=V404=V405=V406=V407=V408=V409=V410=V411=V412=V413=V414=V415=V416=V417=V418=V419=V420=V421=V422=V423=V424=V425=V426=V427=V428=V429=V430=V431=V432=V433=V434=V435=V436=V437=V438=V439=V440=V441=V442=V443=V444=V445=V446=V447=V448=V449=V450=V451=V452=V453=V454=V455=V456=V457=V458=V459=V460=V461=V462=V463=V464=V465=V466=V467=V468=V469=V470=V471=V472=V473=V474=V475=V476=V477=V478=V479=V480=V481=V482=V483=V484=V485=V486=V487=V488=V489=V490=V491=V492=V493=V494=V495=V496=V497=V498=V499=V500=V501=V502=V503=V504=V505=V506=V507=V508=V509=V510=V511=V512=V513=V514=V515=V516=V517=V518=V519=V520=V521=V522=V523=V524=V525=V526=V527=V528=V529=V530=V531=V532=V533=V534=V535=V536=V537=V538=V539=V540=V541=V542=V543=V544=V545=V546=V547=V548=V549=V550=V551=V552=V553=V554=V555=V556=V557=V558=V559=V560=V561=V562=V563=V564=V565=V566=V567=V568=V569=V570=V571=V572=V573=V574=V575=V576=V577=V578=V579=V580=V581=V582=V583=V584=V585=V586=V587=V588=V589=V590=V591=V592=V593=V594=V595=V596=V597=V598=V599=V600=V601=V602=V603=V604=V605=V606=V607=V608=V609=V610=V611=V612=V613=V614=V615=V616=V617=V618=V619=V620=V621=V622=V623=V624=V625=V626=V627=V628=V629=V630=V631=V632=V633=V634=V635=V636=V637=V638=V639=V640=V641=V642=V643=V644=V645=V646=V647=V648=V649=V650=V651=V652=V653=V654=V655=V656=V657=V658=V659=V660=V661=V662=V663=V664=V665=V666=V667=V668=V669=V670=V671=V672=V673=V674=V675=V676=V677=V678=V679=V680=V681=V682=V683=V684=V685=V686=V687=V688=V689=V690=V691=V692=V693=V694=V695=V696=V697=V698=V699=V700=V701=V702=V703=V704=V705=V706=V707=V708=V709=V710=V711=V712=V713=V714=V715=V716=V717=V718=V719=V720=V721=V722=V723=V724=V725=V726=V727=V728=V729=V730=V731=V732=V733=V734=V735=V736=V737=V738=V739=V740=V741=V742=V743=V744=V745=V746=V747=V748=V749=V750=V751=V752=V753=V754=V755=V756=V757=V758=V759=V760=V761=V762=V763=V764=V765=V766=V767=V768=V769=V770=V771=V772=V773=V774=V775=V776=V777=V778=V779=V780=V781=V782=V783=V784=V785=V786=V787=V788=V789=V790=V791=V792=V793=V794=V795=V796=V797=V798=V799=V800=V801=V802=V803=V804=V805=V806=V807=V808=V809=V810=V811=V812=V813=V814=V815=V816=V817=V818=V819=V820=V821=V822=V823=V824=V825=V826=V827=V828=V829=V830=V831=V832=V833=V834=V835=V836=V837=V838=V839=V840=V841=V842=V843=V844=V845=V846=V847=V848=V849=V850=V851=V852=V853=V854=V855=V856=V857=V858=V859=V860=V861=V862=V863=V864=V865=V866=V867=V868=V869=V870=V871=V872=V873=V874=V875=V876=V877=V878=V879=V880=V881=V882=V883=V884=V885=V886=V887=V888=V889=V890=V891=V892=V893=V894=V895=V896=V897=V898=V899=V900=V901=V902=V903=V904=V905=V906=V907=V908=V909=V910=V911=V912=V913=V914=V915=V916=V917=V918=V919=V920=V921=V922=V923=V924=V925=V926=V927=V928=V929=V930=V931=V932=V933=V934=V935=V936=V937=V938=V939=V940=V941=V942=V943=V944=V945=V946=V947=V948=V949=V950=V951=V952=V953=V954=V955=V956=V957=V958=V959=V960=V961=V962=V963=V964=V965=V966=V967=V968=V969=V970=V971=V972=V973=V974=V975=V976=V977=V978=V979=V980=V981=V982=V983=V984=V985=V986=V987=V988=V989=V990=V991=V992=V993=V994=V995=V996=V997=V998=V999=V1000=V1001=V1002=V1003=V1004=V1005=V1006=V1007=V1008=V1009=V1010=V1011=V1012=V1013=V1014=V1015=V1016=V1017=V1018=V1019=V1020=V1021=V1022=V1023=V1024=V1025=V1026=V1027=V1028=V1029=V1030=V1031=V1032=V1033=V1034=V1035=V1036=V1037=V1038=V1039=V1040=V1041=V1042=V1043=V1044=V1045=V1046=V1047=V1048=V1049=V1050=V1051=V1052=V1053=V1054=V1055=V1056=V1057=V1058=V1059=V1060=V1061=V1062=V1063=V1064=V1065=V1066=V1067=V1068=V1069=V1070=V1071=V1072=V1073=V1074=V1075=V1076=V1077=V1078=V1079=V1080=V1081=V1082=V1083=V1084=V1085=V1086=V1087=V1088=V1089=V1090=V1091=V1092=V1093=V1094=V1095=V1096=V1097=V1098=V1099=V1100=V1101=V1102=V1103=V1104=V1105=V1106=V1107=V1108=V1109=V1110=V1111=V1112=V1113=V1114=V1115=V1116=V1117=V1118=V1119=V1120=V1121=V1122=V1123=V1124=V1125=V1126=V1127=V1128=V1129=V1130=V1131=V1132=V1133=V1134=V1135=V1136=V1137=V1138=V1139=V1140=V1141=V1142=V1143=V1144=V1145=V1146=V1147=V1148=V1149=V1150=V1151=V1152=V1153=V1154=V1155=V1156=V1157=V1158=V1159=V1160=V1161=V1162=V1163=V1164=V1165=V1166=V1167=V1168=V1169=V1170=V1171=V1172=V1173=V1174=V1175=V1176=V1177=V1178=V1179=V1180=V1181=V1182=V1183=V1184=V1185=V1186=V1187=V1188=V1189=V1190=V1191=V1192=V1193=V1194=V1195=V1196=V1197=V1198=V1199=V1200=V1201=V1202=V1203=V1204=V1205=V1206=V1207=V1208=V1209=V1210=V1211=V1212=V1213=V1214=V1215=V1216=V1217=V1218=V1219=V1220=V1221=V1222=V1223=V1224=V1225=V1226=V1227=V1228=V1229=V1230=V1231=V1232=V1233=V1234=V1235=V1236=V1237=V1238=V1239=V1240=V1241=V1242=V1243=V1244=V1245=V1246=V1247=V1248=V1249=V1250=V1251=V1252=V1253=V1254=V1255=V1256=V1257=V1258=V1259=V1260=V1261=V1262=V1263=V1264=V1265=V1266=V1267=V1268=V1269=V1270=V1271=V1272=V1273=V1274=V1275=V1276=V1277=V1278=V1279=V1280=V1281=V1282=V1283=V1284=V1285=V1286=V1287=V1288=V1289=V1290=V1291=V1292=V1293=V1294=V1295=V1296=V1297=V1298=V1299=V1300=V1301=V1302=V1303=V1304=V1305=V1306=V1307=V1308=V1309=V1310=V1311=V1312=V1313=V1314=V1315=V1316=V1317=V1318=V1319=V1320=V1321=V1322=V1323=V1324=V1325=V1326=V1327=V1328=V1329=V1330=V1331=V1332=V1333=V1334=V1335=V1336=V1337=V1338=V1339=V1340=V1341=V1342=V1343=V1344=V1345=V1346=V1347=V1348=V1349=V1350=V1351=V1352=V1353=V1354=V1355=V1356=V1357=V1358=V1359=V1360=V1361=V1362=V1363=V1364=V1365=V1366=V1367=V1368=V1369=V1370=V1371=V1372=V1373=V1374=V1375=V1376=V1377=V1378=V1379=V1380=V1381=V1382=V1383=V1384=V1385=V1386=V1387=V1388=V1389=V1390=V1391=V1392=V1393=V1394=V1395=V1396=V1397=V1398=V1399=V1400=V1401=V1402=V1403=V1404=V1405=V1406=V1407=V1408=V1409=V1410=V1411=V1412=V1413=V1414=V1415=V1416=V1417=V1418=V1419=V1420=V1421=V1422=V1423=V1424=V1425=V1426=V1427=V1428=V1429=V1430=V1431=V1432=V1433=V1434=V1435=V1436=V1437=V1438=V1439=V1440=V1441=V1442=V1443=V1444=V1445=V1446=V1447=V1448=V1449=V1450=V1451=V1452=V1453=V1454=V1455=V1456=V1457=V1458=V1459=V1460=V1461=V1462=V1463=V1464=V1465=V1466=V1467=V1468=V1469=V1470=V1471=V1472=V1473=V1474=V1475=V1476=V1477=V1478=V1479=V1480=V1481=V1482=V1483=V1484=V1485=V1486=V1487=V1488=V1489=V1490=V1491=V1492=V1493=V1494=V1495=V1496=V1497=V1498=V1499=V1500=V1501=V1502=V1503=V1504=V1505=V1506=V1507=V1508=V1509=V1510=V1511=V1512=V1513=V1514=V1515=V1516=V1517=V1518=V1519=V1520=V1521=V1522=V1523=V1524=V1525=V1526=V1527=V1528=V1529=V1530=V1531=V1532=V1533=V1534=V1535=V1536=V1537=V1538=V1539=V1540=V1541=V1542=V1543=V1544=V1545=V1546=V1547=V1548=V1549=V1550=V1551=V1552=V1553=V1554=V1555=V1556=V1557=V1558=V1559=V1560=V1561=V1562=V1563=V1564=V1565=V1566=V1567=V1568=V1569=V1570=V1571=V1572=V1573=V1574=V1575=V1576=V1577=V1578=V1579=V1580=V1581=V1582=V1583=V1584=V1585=V1586=V1587=V1588=V1589=V1590=V1591=V1592=V1593=V1594=V1595=V1596=V1597=V1598=V1599=V1600=V1601=V1602=V1603=V1604=V1605=V1606=V1607=V1608=V1609=V1610=V1611=V1612=V1613=V1614=V1615=V1616=V1617=V1618=V1619=V1620=V1621=V1622=V1623=V1624=V1625=V1626=V1627=V1628=V1629=V1630=V1631=V1632=V1633=V1634=V1635=V1636=V1637=V1638=V1639=V1640=V1641=V1642=V1643=V1644=V1645=V1646=V1647=V1648=V1649=V1650=V1651=V1652=V1653=V1654=V1655=V1656=V1657=V1658=V1659=V1660=V1661=V1662=V1663=V1664=V1665=V1666=V1667=V1668=V1669=V1670=V1671=V1672=V1673=V1674=V1675=V1676=V1677=V1678=V1679=V1680=V1681=V1682=V1683=V1684=V1685=V1686=V1687=V1688=V1689=V1690=V1691=V1692=V1693=V1694=V1695=V1696=V1697=V1698=V1699=V1700=V1701=V1702=V1703=V1704=V1705=V1706=V1707=V1708=V1709=V1710=V1711=V1712=V1713=V1714=V1715=V1716=V1717=V1718=V1719=V1720=V1721=V1722=V1723=V1724=V1725=V1726=V1727=V1728=V1729=V1730=V1731=V1732=V1733=V1734=V1735=V1736=V1737=V1738=V1739=V1740=V1741=V1742=V1743=V1744=V1745=V1746=V1747=V1748=V1749=V1750=V1751=V1752=V1753=V1754=V1755=V1756=V1757=V1758=V1759=V1760=V1761=V1762=V1763=V1764=V1765=V1766=V1767=V1768=V1769=V1770=V1771=V1772=V1773=V1774=V1775=V1776=V1777=V1778=V1779=V1780=V1781=V1782=V1783=V1784=V1785=V1786=V1787=V1788=V1789=V1790=V1791=V1792=V1793=V1794=V1795=V1796=V1797=V1798=V1799=V1800=V1801=V1802=V1803=V1804=V1805=V1806=V1807=V1808=V1809=V1810=V1811=V1812=V1813=V1814=V1815=V1816=V1817=V1818=V1819=V1820=V1821=V1822=V1823=V1824=V1825=V1826=V1827=V1828=V1829=V1830=V1831=V1832=V1833=V1834=V1835=V1836=V1837=V1838=V1839=V1840=V1841=V1842=V1843=V1844=V1845=V1846=V1847=V1848=V1849=V1850=V1851=V1852=V1853=V1854=V1855=V1856=V1857=V1858=V1859=V1860=V1861=V1862=V1863=V1864=V1865=V1866=V1867=V1868=V1869=V1870=V1871=V1872=V1873=V1874=V1875=V1876=V1877=V1878=V1879=V1880=V1881=V1882=V1883=V1884=V1885=V1886=V1887=V1888=V1889=V1890=V1891=V1892=V1893=V1894=V1895=V1896=V1897=V1898=V1899=V1900=V1901=V1902=V1903=V1904=V1905=V1906=V1907=V1908=V1909=V1910=V1911=V1912=V1913=V1914=V1915=V1916=V1917=V1918=V1919=V1920=V1921=V1922=V1923=V1924=V1925=V1926=V1927=V1928=V1929=V1930=V1931=V1932=V1933=V1934=V1935=V1936=V1937=V1938=V1939=V1940=V1941=V1942=V1943=V1944=V1945=V1946=V1947=V1948=V1949=V1950=V1951=V1952=V1953=V1954=V1955=V1956=V1957=V1958=V1959=V1960=V1961=V1962=V1963=V1964=V1965=V1966=V1967=V1968=V1969=V1970=V1971=V1972=V1973=V1974=V1975=V1976=V1977=V1978=V1979=V1980=V1981=V1982=V1983=V1984=V1985=V1986=V1987=V1988=V1989=V1990=V1991=V1992=V1993=V1994=V1995=V1996=V1997=V1998=V1999=V2000=V2001=V2002=V2003=V2004=V2005=V2006=V2007=V2008=V2009=V2010=V2011=V2012=V2013=V2014=V2015=V2016=V2017=V2018=V2019=V2020=V2021=V2022=V2023=V2024=V2025=V2026=V2027=V2028=V2029=V2030=V2031=V2032=V2033=V2034=V2035=V2036=V2037=V2038=V2039=V2040=V2041=V2042=V2043=V2044=V2045=V2046=V2047=V2048=V2049=V2050=V2051=V2052=V2053=V2054=V2055=V2056=V2057=V2058=V2059=V2060=V2061=V2062=V2063=V2064=V2065=V2066=V2067=V2068=V2069=V2070=V2071=V2072=V2073=V2074=V2075=V2076=V2077=V2078=V2079=V2080=V2081=V2082=V2083=V2084=V2085=V2086=V2087=V2088=V2089=V2090=V2091=V2092=V2093=V2094=V2095=V2096=V2097=V2098=V2099=V2100=V2101=V2102=V2103=V2104=V2105=V2106=V2107=V2108=V2109=V2110=V2111=V2112=V2113=V2114=V2115=V2116=V2117=V2118=V2119=V2120=V2121=V2122=V2123=V2124=V2125=V2126=V2127=V2128=V2129=V2130=V2131=V2132=V2133=V2134=V2135=V2136=V2137=V2138=V2139=V2140=V2141=V2142=V2143=V2144=V2145=V2146=V2147=V2148=V2149=V2150=V2151=V2152=V215
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# E - EQUIP CHECK (cont)

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6880 R=516
6890 REM ** -THERMISTOR GAIN H-
6900 FORMAT SX,"#1 LEAK TEST F1.0 DB F1.1 "+"F2.0
6910 FORMAT F3.0,"DB F2.0"
6920 FORMAT F3.0,"DB F1.1"
6930 FORMAT SX,"MEAS FLEET F1.0 F2.0"
6940 WRITE (13,6900)F6,
6950 IF F6 THEN 6980
6960 WRITE (15,6910)A1,
6970 GOTO 6990
6980 WRITE (15,6920)A1,
6990 WRITE (15,6930)A2
7000 FORMAT SX,"#2 LEAK TEST F1.0 F2.0 F3.0 "+"F4.0
7010 FORMAT SX,"UNIT "+"F7.4,"DB"*/7.4
7020 WRITE (15,7000)F6,
7030 IF F6 THEN 7060
7040 WRITE (15,6910)A2,
7050 GOTO 7070
7060 WRITE (15,6920)A2,
7070 WRITE (15,7010)I5
7080 PRINT
7090 FORMAT SX,F6.3,4X,F6.3,4X,F6.3,4X,F6.3,4X,F6.3,4X,F6.3," DB",F6.3
7100 WRITE (15,7090)-25*I5,-15*I5,-5*(I5,5*I5,15*I5,25*I5
7110 A#="!.....!.....!.....!.....!.....!.....!.....!"
7120 PRINT TAB8,A#
7130 N=1
7140 J1=0
7150 T3=FNRS
7160 GOSUB 7290
7170 R5=R2
7180 I6=R5
7190 FORMAT "#/TIME",J1X,"CDPA="*,F6.3," DB",22X," AVE ",3X,"#1 PUR"
7200 WRITE (15,7190)I#
7210 GOTO 7340
7220 R=517
7230 N=N+1
7240 IF N>36 AND F2=1 THEN 7390
7250 IF F7=0 THEN 7290
7260 J1=J1+1
7270 IF J1<10 THEN 7290
7280 J1=0
7290 Q=FNX/63-J1)
7300 IF N>30-INT(N/30) THEN 7310
7310 PRINT TAB8,A#
7320 GOSUB 7090
7330 R5=(5+R5+R2)/10
7340 X3=(R2-I6)/I5+25
7350 IF ABS((R5-I6)/I5-1)>10 THEN 7390
7360 I6=R5
7370 WRITE (15,7190)I#
7380 IF X3.0 OK (3>50) THEN 7390
7390 ENTER (3,-)0,T4
7400 IF INT(T4-10)-INT(T-10) THEN 7390
7410 FORMAT F4.0,4X
7420 WRITE (15,7410)H,
7430 Q0=FND1
7440 GOTO 7480

```

# E - EQUIP CHECK (cont)

```

7450 FORMAT F6.2;20
7460 WRITE (15,7450) (I100*(14+10)*4-1014)*100+
7470 T3=I4
7480 X4=INT(S/I5)
7490 IF (I4>1) THEN T510
7500 X4=1
7510 IF (X3-X4)<0 AND (X3+X4>50) THEN 7650
7520 IF (X3-X4)<0 THEN 7690
7530 IF (X3+X4)>50 THEN 7690
7540 PRINT TAB(X3-X4);"1";TAB(X3+X4);"1";TAB50;
7550 GOTO 7630
7560 FORMAT 4X;"(OFF-SHAFT) RATIO=";F8.4;" DB +/-";F7.4;" DB";4,F5.1
7570 WRITE (15,7560)R3,S;
7580 GOTO 7630
7590 PRINT TABX3;"+";TAB(X3+X4);"1";TAB50;
7600 GOTO 7630
7610 PRINT TAB(X3-X4);"1";TAB(X3+X4);"1";TAB50;
7620 FORMAT F10.4;"DB";F7.3;"MN";F8.4
7630 WRITE (15,7620)R2,P
7640 GOTO 7220
7650 PRINT TABX3;"+";TAB50;
7660 FORMAT 4X;"SIGMA =" ;F6.3;" DB
7670 WRITE (15,7660)S
7680 GOTO 7220
7690 R=510
7700 REM **** PWR SUB: P=PWR, S=SIGMA IN DB
7710 S=M1=M2=V2=0
7720 Q=FN01
7730 FOR I=1 TO N3
7740 Q=FNX(63-R1+F6)
7750 P=FNPC3
7760 P6=P
7770 M1=M1+P6
7780 P=FNX(63-R2+F6)+FNP3
7785 IF P=0 THEN 7804
7790 IF (F6/P) <= 0 THEN 7801
7800 R1=10*LOG(P6/P)
7802 GOTO 7810
7804 PRINT "7804:P6,P1,P6,P
7810 M2=M2+R1
7820 V2=V2+R1*R1
7830 NEXT I
7840 P=M1/N3
7850 R2=M2/N3
7860 IF N3=1 THEN 7880
7870 S=10*LOG(1+SOR((V2-M3*M3)/N3/(N3-1)))
7880 RETURN
7890 Q=FN06
7900 RETURN 0

```

# E - EQUIP CHECK (cont)

```

7910 R=519
7920 P1[13]= "KEY C: CHANNEL 1 VOLTS"
7930 Q=FNC3+FND0+FND1
7940 RESTORE 7940
7950 FORMAT 3%,"CHANNEL 1 VOLTS",VOLTIME*1%,"STATUS ",R,"POSITION ",100," "+PAGE
7960 WRITE (15,7950)
7970 Q=FNS2
7980 FOR J=0 TO 10
7990 READ A#,A1,A2
8000 GOTO INT(A1/100) OF 8020,8040,8060
8010 GOTO 8080
8020 A1=10*FNV7.09
8030 GOTO 8080
8040 A1=NC1.51
8050 GOTO 8080
8060 Q=FNV7.09
8070 A1=FNV7.08-NC1.01*FNV7.07
8080 Q=FNV(7+J/100)
8090 PRINT A#,TAB15,0,TAB30,
8100 A#=" OK"
8110 IF OKA1+A2 AND Q<A1 A2 THEN 8140
8120 A#="*NOT NORMAL*"
8130 Q=FNB3
8140 PRINT A#,TAB45,A1,A2
8150 PRINT
8160 NEXT J
8170 Q=FNS10
8180 DATA "0=DC OFFSET",0,1E-05
8190 DATA "1=TEMP",0.5,0.5
8200 DATA "2=DEW POINT",0.5,0.5
8210 DATA "3=+20 VOLTS",20,0.2
8220 DATA "4=+12 VOLTS",11.9,0.1
8230 DATA "5=DAC OUTPUT",100,0.01
8240 DATA "6=XTAL DIODE",-0.0125,0.0125
8250 DATA "7=D/A REF",200,0.01
8260 DATA "8=BRDG OUTPUT",2.5,0.1
8270 DATA "9=SET FINE REF",300,0.005
8280 DATA "10=BRDG vs REF",0,0.001
8290 Q=FNS12
8300 RETURN 0
8500 R=520
8510 FORMAT 10%,"SIML STAR ATTN:",F4.1," dB",11%,"IF FREQ: ",F9.0," MHz"
8520 FORMAT 10%,"INPUT ATTN:",F8.0," dB",11%,"REINDB:",F11.1," MHz"
8525 FORMAT 10%,"STD ATTN:",F8.0," dB",11%,"#1 #20dB:",F9.4
8530 WRITE (15,8510)H,C
8540 WRITE (15,8520)E6,C9
8545 WRITE (15,8525)10*LGTR3,m9
8550 RETURN 0

```

# E - EQUIP CHECK (cont)

```

8550 R=521
8570 P#C137="KEY 6:
8580 F8=10*(Q-INTQ)
8590 N=3
8600 F4=1
8610 IF F2 AND NOT F3 THEN 8720
8620 F4=2
8705 IF F2 THEN 8722
8710 DISP "1=SIMUL,2=EMERGENCY TEST"
8712 F4=FNB2+FNMF4
8714 DISP "EMER/SET:"
8716 N=FNHN+FND0+FND1+FN
8722 C2=1
8724 P=FNPO
8726 IF Q/Q1>0.5 THEN 8740
8728 C2=0
8740 P#C213="SIMULATED NOTICE ASD TEST"
8760 IF F4=1 THEN 8772
8770 P#C213="EARTH TERMINAL TEST"
8772 Q=FNQ4+FNS1+FNPO+FN32
8776 P=FND0+FNX66+FNPO+R3
8778 P1=FNX82+FNPO+R2
8780 P2=FNX83+FNX84+FNPO+R3
8782 FORMAT " P=",F7.4," MM",5X,"100 #1=",F7.4," MM",5X,"100 #2=",F7.4,F4.0
8784 WRITE (15,8782)P,P1-P,P2-P," MM 1000/set=",N
8786 IF (P1/P-1)<0.1 THEN 8797
8788 F5=1
8787 IF (P2/P-1)<0.1 THEN 8790
8788 F6=1
8790 Q=FN32
8800 FORMAT " P(MM) P+1+2 #1(MM) #2(MM) #1+#2 #1/#2 P.#1'
8810 WRITE (15,8800)" P #2 P+1+2 STDck"
8815 FORMAT 76X,"dB"
8816 WRITE (15,8815)
8817 E2=-1
8820 N0=N1=N2=N3=N4=N5=N6=N7=N8=N9=N10=N11=N12=N13=N14=N15=N16=N17=N18=N19=0
8824 F7=E2=52+1
8826 IF E2=16 AND F2=1 THEN 8400
8828 IF E2=16 THEN 8772
8830 FOR A=1 TO N
8832 E2=F7
8840 C2=1+FNX81+FND1
8842 IF F5=0 THEN 8945
8850 P=FNPO
8852 E2=F7
8860 IF Q2/Q1>0.5 THEN 8890
8870 C2=0
8880 P=FNPO
8882 E2=F7
8890 N7=N7+P
8900 M7=M7+P+2
8908 P1=5*(Q3-Q1)
8910 N3=N3+P1
8920 M3=M3+P1+2
8930 N1=N1+5+Q1
8940 M1=M1+25*Q1+2
8945 IF F6=0 THEN 8005
8950 C2=1
8960 P=FNPO
8962 E2=F7

```

# E - EQUIP CHECK (cont)

```

8970 IF Q2/Q1>0.5 THEN 9000
8980 C2=0
8990 P=FNP2
8992 E2=F7
9000 N8=N8+P
9010 N3=N8+P+2
9018 P2=5*(Q3-Q1)
9020 N4=N4+P2
9030 N4=N4+P2+2
9040 N1=N1+5*Q1
9050 M1=M1+25*Q1+2
9055 IF (F5+F6)=0 THEN 9210
9060 C2=1
9070 P=FNP0
9072 E2=F7
9080 IF Q2/Q1>0.5 THEN 9110
9090 C2=0
9100 P=FNP0
9102 E2=F7
9110 N9=N9+P
9120 N9=N9+P+2
9130 O5=O5+5*(Q3-Q1)
9140 M5=M5+(25*(Q3-Q1)+2)
9150 N1=N1+5*Q1
9160 M1=M1+25*Q1+2
9162 Q=P1/P2
9170 O6=O6+Q
9180 M6=M6+Q*Q
9190 N2=N2+5*Q2
9200 M2=M2+25*Q2+2
9210 P=FNX67+FNP3
9212 E2=F7
9220 N1=N1+P
9230 M1=M1+P+2
9240 P1=FNX66+FNP3
9242 E2=F7
9250 Q=10*LGT(P/P1)-10*LGT3
9260 N0=N0+Q
9270 M0=M0+Q+2
9275 NEXT A
9280 FORMAT 10F8.4
9282 Q=(1+F5+F6+((F5+F6)*#0))/N
9290 WRITE (15,9280)N1/Q,N2/N,N3/N,N4/N,N5/N,N6/N,N7/N,N8/N,N9/N,N0/N
9300 FORMAT F6.2,"% ",F6.2,"% ",F6.2
9301 E=N-1
9302 Q1=(M1-N1+2/Q)/(Q-1+(Q=1))
9303 IF Q1>0 THEN 9305
9304 Q1=1
9305 Q2=(M2-N2+2/N)/E
9306 IF Q2>0 THEN 9309
9307 Q2=1
9309 N2=N2+(N2=0)
9310 WRITE (15,9300)100+Q0R01/N1+Q+100+Q0R02/N2+N
9311 N3=N3+(N3=0)
9312 Q1=(M3-N3+2/N)/E
9313 IF Q1>0 THEN 9316
9314 Q1=1
9316 N4=N4+(N4=0)
9317 Q2=(M4-N4+2/N)/E

```



# E - EQUIP CHECK (cont)

```

9318 IF Q2=0 THEN 9320
9319 Q2=1
9320 WRITE (15,9300)100*(Q2-Q3)/(Q2+Q3) Q322 4-+
9322 Q5=Q5+(Q5=0)
9323 Q1=(N5-Q5+Q5/N)/E
9324 IF Q1>0 THEN 9325
9325 Q1=1
9326 Q6=Q6+(Q6=0)
9327 Q2=(N6-Q6+Q6/N)/E
9328 IF Q2>0 THEN 9329
9329 Q2=1
9330 WRITE (15,9300)100*(Q2-Q3)/(Q2+Q3) Q322 4-+
9332 N7=N7+(N7=0)
9333 Q1=(N7-N7+N7/N)/E
9334 IF Q1>0 THEN 9335
9335 Q1=1
9336 N8=N8+(N8=0)
9337 Q2=(N8-N8+N8/N)/E
9338 IF Q2>0 THEN 9339
9339 Q2=1
9340 WRITE (15,9300)100*(Q2-Q3)/(Q2+Q3) Q322 4-+
9341 N9=N9+(N9=0)
9342 Q1=(N9-N9+N9/N)/E
9343 IF Q1>0 THEN 9344
9344 Q1=1
9345 N0=N0+(N0=0)
9346 Q2=(N0-N0+N0/N)/E
9347 IF Q2>0 THEN 9348
9348 Q2=1
9349 FORMAT F6.2,"% ",F8.4
9350 WRITE (15,9349)100*(Q2-Q3)/(Q2+Q3) Q322 4-+
9352 PRINT
9390 GOTO 8838
9400 RETURN 0
9500 R=522
9510 P#(13)="KEY 7: CHARACTER ATTENUATION VALUE
9515 FIXED 4
9520 PRINT "STD("10*LGTS3:"32")"
9530 A3=NF(1,3)=FNNA3
9570 GOTO 9515
9900 GOTO 9998

```

# E - EQUIP CHECK (cont)

R	3700 5180 8560	3980 5620 9500	4130 5800	4130 5800	4200 5800	4250 6280	4466 6880	4530 7220	4830 7690	5020 7910	5080 8560
Q	3900 4140 4490 5600 6740 8110 9170 9310	3910 4160 4500 5660 7290 8110 9180	3920 4170 4712 5830 7090 8130 9130	3930 4180 4800 5850 7220 8170 9250	3940 4200 4800 5882 7240 8290 9260	4000 4230 5040 5882 7890 8580 9270	4110 4330 5210 5882 7930 8580 9282	4122 4330 5300 6490 7970 8580 9290	4140 4470 5440 6580 8060 8726 9302	4140 4476 5480 6630 8080 8790 9302	4140 4478 5560 6670 8090 9162 9302
H#	3960	3970									
NSC 1	3965 8070	3970 9530	4022	4024	4405	4407	4655	4720	4720	6410	8040
R#	3970 4730 8100	4550 4750 8120	4570 4770 8140	4590 4870	4610 4900	4630 4940	4650 7110	4670 7120	4674 7310	4690 7990	4710 8090
B#	3970										
D#	3970										
L#	3970										
P#	3970	4090	4180	4840	5030	5830	7920	8570	8740	8770	9510
X#	3970										
A	3980 8830	4260 9275	4270	4230	4230	4200	4310	4320	4322	4324	4328
A1	3980 6110 8110	5390 6150 8140	5410 6960	5420 6980	5420 7740	5440 7990	5440 8080	5540 8020	5560 8040	5590 8070	5962 8110
A2	3980 7780	5430 7990	5480 8110	5560 8110	5560 8140	5580	5964	6120	6150	7040	7060
C	3980										
C2	3980 9060	5070 9090	6270	6330	6330	8722	8728	8840	8870	8950	8980
C3	3980	5890	6310	6310	6600	7750					
C8	3980	4030	4400	4400	4405	4407	6430	6430	8530		
C9	3980	4032	4420	4420	6450	6450	8540				
E6	3980 8540	4440	4440	4655	4600	4720	5540	6360	6360	6940	7020
F1	3980	5920	5975	6020	6020	6030	6280	6370			
F2	3980 8826	4202	4467	5090	5090	6000	6602	6862	7240	8610	8705
F3	3980	5050	5110	5200	5250	5280					

# E - EQUIP CHECK (cont)

F4	3980	8600	8620	8712	8711	8760						
F5	3980	5920	5975	6260	6540	8786	8842	9055	9182	9282		
F6	3980 8788	5940 8945	6070 9655	6100 9280	6160 9242	6130	6170	6950	7030	7240	7730	
F7	3980 8992	5930 9072	6050 9102	6050 9212	6060 9242	7250	8824	8832	8652	8881	8962	
F9	3980											
H	3990	4034	4460	4460	5390	6390	8520					
I	3990 7730	4910 7830	4920	4920	4920	4920	4950	4970	4990	5670	5750	
I5	3990 7340	5950 7350	6210 7480	6210	7070	7100	7100	7100	7100	7100	7100	
I6	3990	7180	7200	7340	7350	7360	7370					
J	3990	7980	8080	8160								
J1	3990	7140	7260	7260	7270	7280	7290					
M	3990	5640	5730	5730	5760	5780	5780					
M1	3990 8820	6590 8940	6690 8940	6690 9050	6720 9050	6720 9160	6720 9160	7710 9230	7770 9230	7770 9302	7840	
M2	3990 7870	6590 7870	6760 8920	6760 9200	6790 9200	6790 9305	6790	7710	7810	7810	7850	
N	3990 6590 7130 8830 9301 9333	5060 6650 7230 9282 9305 9337	5150 6650 7230 9290 9310 9340	5150 6660 7240 9290 9312 9340	5240 6810 7300 9290 9317 9342	5270 6830 7300 9290 9320 9346	5670 6830 7420 8590 9320 9350	5760 6830 8590 8716 9323 9350	5770 6850 8716 9290 9327 9350	5780 6850 8716 9290 9330 9350	5780 6862 8784 9290 9330	
N1	3990 9040	6590 9040	6680 9150	6680 9150	6710 9220	6720 9220	6720 9290	6720 9302	8820 9310	8930	8930	
N2	3990 9290	6590 9305	6750 9309	6750 9309	6780 9309	6790 9310	6790	6790	8820	9190	9190	
N3	3990 8820	5960 8910	6190 8910	6190 9290	6390 9311	7730 9311	7840 9311	7850 9312	7860 9320	7870	7970	
N5	3990											
N6	3990	4380	4380									
O5	3990	8820	9130	9130	9290	9322	9322	9322	9323	9323	9330	
O6	3990	8820	9170	9170	9390	9326	9326	9326	9327	9327	9330	
P	4000 6700 7780 8785 9100	5200 6760 7785 8850 9110	5460 6770 7190 8850 9120	5500 6770 7800 8880 9210	5700 6820 7004 8920 9230	5780 6830 7040 8960 9250	5820 6830 7824 8960 9250	5850 6840 8776 8990 9250	6000 7630 8784 9000 9010	6690 7750 8784 9010 9070	6700 7760 8784 9070	
P0	4000	5200	5240	5270	5540							

# E - EQUIP CHECK (cont)

P1	4000 9162	5460 9240	5540 9250	5540	5540	8778	8784	8785	8808	8910	8920
P2	4000 9018	5500 9020	5540 9030	5540 9162	6590	6820	6830	6840	8780	8784	8787
P3	4000										
P5	4000	5700	5720	5730	5740	5740					
P6	4000	7760	7770	7790	7800	7804					
Q0	4000	6230	6260	6280	6290	7130					
Q1	4000 9130 9320 9344	8726 9140 9323 9350	8860 9150 9324	8968 9160 9325	8930 9302 9320	8940 9303 9333	8970 9304 9334	9018 9310 9335	9040 9312 9340	9050 9313 9342	9080 9314 9343
Q2	4000 9318 9346	8860 9319 9347	8970 9320 9348	9080 9327 9350	9130 9328	9200 9329	9305 9330	9306 9337	9307 9338	9310 9339	9317 9340
Q3	4000	8908	9018	9130	9140						
Q4	4000	6610	6620	6640							
R1	4000	7800	7810	7820	7820						
R2	4000	7170	7330	7340	7570	7630	7850				
R5	4000	7170	7180	7330	7330	7350	7360				
S	4000 7480	5240 7570	5270 7670	5470 7710	5510 7870	5640	5780	6590	6720	6790	6830
S1	4000	5470	5540	6590							
S2	4000	5510	5560	6590							
T0	4000	6340									
T1	4000	5900	6620	6640							
T2	4000										
T3	4000	7150	7400	7470							
T4	4000	7390	7400	7460	7460	7470					
V	4010	6830									
V1	4010	5640	5740	5740	5780	6590	6700	6700	6730		
V2	4010	6590	6770	6770	6790	7710	7820	7820	7870		
V7	4010	6830									
V8	4010	6830									
V9	4010	6830									
X2	4020										
X3	4030 7590	7340 7590	7330 7610	7350 7610	7510 7610	7510	7520	7530	7540	7540	7540

# E - EQUIP CHECK (cont)

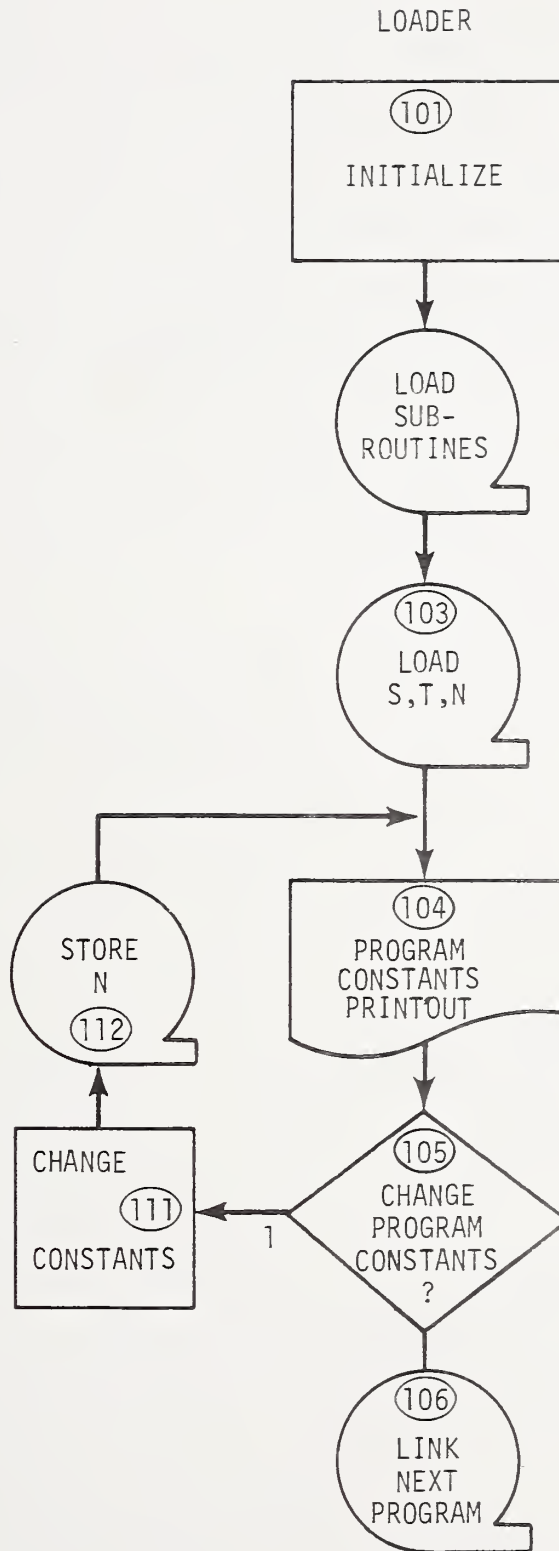
J4	4020 7610	7480	7490	7500	7510	7510	7520	7530	7540	7540	7590
Z	4020	5820	5850								
R3	4022 9250	4405 9520	5350 9530	5405 9530	6110	6110	6830	8545	8776	8778	8780
R8	4024	4407	8545								
F	4040										
E2	4050 9072	8817 9102	8824 9212	8824 9242	8826	8828	8832	8852	8882	8962	8992
G	4060										
D	4070										
T	4080										
FNJ	4110 5110	4160 8716	4476	4476	4478	4478	4478	4478	4478	4478	4500
FNF	4122	5210	6490	8772							
FNV	4140	4920	4960	5700	8020	8060	8070	8070	8080		
FNX	4140 7740	4140 7780	4850 8776	4880 8778	5440 8780	5480 8780	5830 8840	5850 9210	6670 9240	6740	7290
FNW	4140										
FHR	4140	5900	6610	7150							
FNS	4190 5600	4330 6490	4460 7890	4476 7970	4478 8170	4478 8290	4478 8772	4500 8772	4850 8790	5210	5210
FNB	4220	4380	4490	5110	5150	6020	8130	8712			
FNN	4220 6100 8712	4380 6190 8716	4400 6210 9530	4420 6260	4440 6310	4460 6330	4490 6360	5110 6390	5150 6410	6020 6430	6050 6450
FND	4712 7930	4850 7930	5040 8716	5660 8716	5910 8776	5910 9040	6580	6630	6630	7430	7720
FNC	4850	5210	6490	6630	7930	8772					
FNP	5720 8990	6600 9070	7750 9100	7780 9210	8724 9240	8776	8778	8780	8850	8880	8960
F8	5882	5970	8580	8610							
N0	8820	9260	9260	9290	9345	9345	9345	9346	9346		
N4	8820	9020	9020	9290	9310	9316	9316	9317	9320		
N7	8820	8890	8890	9290	9332	9332	9332	9333	9333	9340	
N8	8820	9000	9000	9290	9316	9336	9336	9337	9337	9340	
N9	8820	9110	9110	9290	9341	9341	9341	9342	9342	9350	
N0	8820	9270	9270	9346							

# E - EQUIP CHECK (cont)

M3	8820	8920	8920	9011							
M4	8820	9030	9030	9017							
M5	8820	9140	9140	9014							
M6	8820	9180	9180	9017							
M7	8820	8900	8900	9014							
M8	8820	9010	9010	9017							
M9	8820	9120	9120	9014							
E	9301	9305	9312	9317	9325	9327	9333	9337	9342	9346	



### 8.3 A - LOADER





# A - LOADER (cont)

```

4260 R=100
4265 GOTO F6 D= 4.10- 5*F7
4270 DISP "LINK:1=SI"
4280 INPUT F6
4300 GOTO 4260
4310 R=107
4315 LINK #0:10-5*F7)
4320 R=108
4325 R=5
4330 R1=2
4340 R5=0.2
4350 R7=10*LGT+G.H5
4360 C2=H0-Z=1
4370 E2=6
4380 E3=30/3600
4390 E5=8/3600
4400 E7=40.349
4410 H4=30
4420 R5=11
4460 LINK #0:10-5*F7)
4470 R=109
4475 R=5
4510 LINK #0:10-5*F7)
4515 R=110
4520 DEF FNO(Q)
4530 A$="ABCDEFGHIJNLAKOPQRSTUVWXYZ"
4540 B$="1234567890"
4550 GOTO 0 OF 5290+3300+5710
4560 GOSUB 4580
4570 RETURN 0
4580 DISP "N DATA VIA E=ENT L=EXIT=INT CASE:"
4590 INPUT Q
4610 NAT N=ZERO(25+11)
4620 LOAD DATA #0:10.1
4630 RETURN
4650 A1=NC1.1]
4660 A2=NC1.2]
4670 A3=NC1.3]
4680 B=NC2.1]
4682 B0=NC2.10]
4700 B2=NC2.2]
4710 B3=NC2.3]
4720 B7=NC2.7]
4730 B8=NC2.8]
4740 B9=NC2.9]
4750 C=NC3.1]
4760 C0=NC3.10]
4770 C1=NC3.1]
4780 C2=NC3.2]
4790 C3=NC3.3]
4800 C4=NC3.4]
4810 C5=NC3.5]
4820 C6=NC3.6]
4830 C7=NC3.7]
4840 C8=NC3.8]
4850 C9=NC3.9]

```

# A - LOADER (cont)

```

4560 B=NC 4,111
4570 D0=NC 4,101
4580 D1=NC 4,11
4590 D2=NC 4,11
4600 D3=NC 4,11
4610 D4=NC 4,41
4620 D5=NC 4,51
4630 D6=NC 4,01
4640 D7=NC 4,51
4650 E=NC 5,111
4660 F=NC 6,111
4670 FA=NC 6,101
4680 F1=0
5000 G=NC 7,111
5010 G4=NC 7,41
5020 G5=NC 7,51
5030 G6=NC 7,61
5040 H=NC 8,111
5050 H1=NC 8,11
5060 H5=NC 8,51
5070 H9=NC 8,91
5080 L=NC 12,111
5090 L1=NC 12,11
5100 L5=NC 12,51
5110 L6=NC 12,61
5120 L7=NC 12,71
5130 L8=NC 12,81
5140 L9=NC 12,91
5150 M=NC 13,111
5160 M=NC 14,111
5170 M1=NC 14,11
5180 M2=NC 14,21
5190 M5=0
5200 M6=NC 14,61
5210 M7=NC 14,71
5215 O3=NC 15,31
5220 T=NC 20,111
5230 U=NC 23,111
5240 TRANSFER TO 9,11 TO F4
5250 RETURN
5290 O=FN15
5300 PRINT TAB(31,"PROGRAM END")
5310 R4="ABCDEFGHIJKLMNOQRSTUVWXYZ"
5320 O1=0
5330 O2=-10
5340 FOR I=1 TO 26
5350 FOR J=1 TO 11
5360 IF NC(I,J)=0 THEN 5470
5370 O1=O1+1
5380 O2=O2+25
5390 IF O2<55 THEN 5410
5400 O2=10
5410 IF O1#1 THEN 5440
5420 PRINT
5430 PRINT
5440 PRINT TAB(25,R4(O1,11)-(O1-10)/25,NC(I,J))
5450 IF INT(O1/25)=O1/25 THEN 5470
5460 PRINT
5470 NEXT J
5480 O2=-10
5490 O1=0
5500 NEXT I
5510 O=FN13+FN15
5520 RETURN 0

```

A - LOADER (cont)





# A - LOADER (cont)

D0	2	4890							
D3	3	4900							
D4	2	4910							
D5	2	4920							
D8	2	4930							
D9	2	4940							
E	2	4950							
E0	2	3980							
E1	2								
E2	2	3980	4070						
E3	2	4380							
E4	2	3980							
E5	2	4390							
E6	2	3980							
E7	2	4400							
E8	2								
E9	2	3980							
F	2	4960							
F0	2	4970							
F1	2	3792	3810	3830	4010	4030			
F2	2	3980							
F3	2	3980							
F4	2	3820		4000	4020	4040			
F5	2	3980							
F6	3	3795	3815	3835	4015	4035	4055		
F7	3	3760	3780	3800	4040	4060	4080	4100	
F8	3	3980							
F9	3								
G	3	4350	5040						
G4	3	5010							
G5	3	5020							
G6	3	5030							
H	1	3980	40						
H1	2	5050							

# A - LOADER (cont)

H5	3	5050									
H9	3	4350	5070								
I	3	5340	5360	5410	5430	5440	5500	5570	5610	5615	5620
I5	3										
J	3	5350	5360	5410	5440	5440	5470	5500	5610	5620	
J1	3										
K	3										
K1	3										
K2	3										
K3	3										
K4	3										
K5	3										
K6	3										
K7	3										
K8	3										
K9	3										
L0	4										
L1	4	3980	5090								
L4	4										
L5	4	5100									
L6	4	5110									
L7	4	5120									
L8	4	5130									
L9	4	5140									
M	4	5150	5010	5050	5070	5140	5165				
M1	4										
M2	4										
M3	4										
N	4	3980	5100	5100	5170	5620	5650	5650			
N0	4	10	4360								
N1	4	5170									
N2	4	5180									
N3	4										
N4	4	4410									

# A - LOADER (cont)

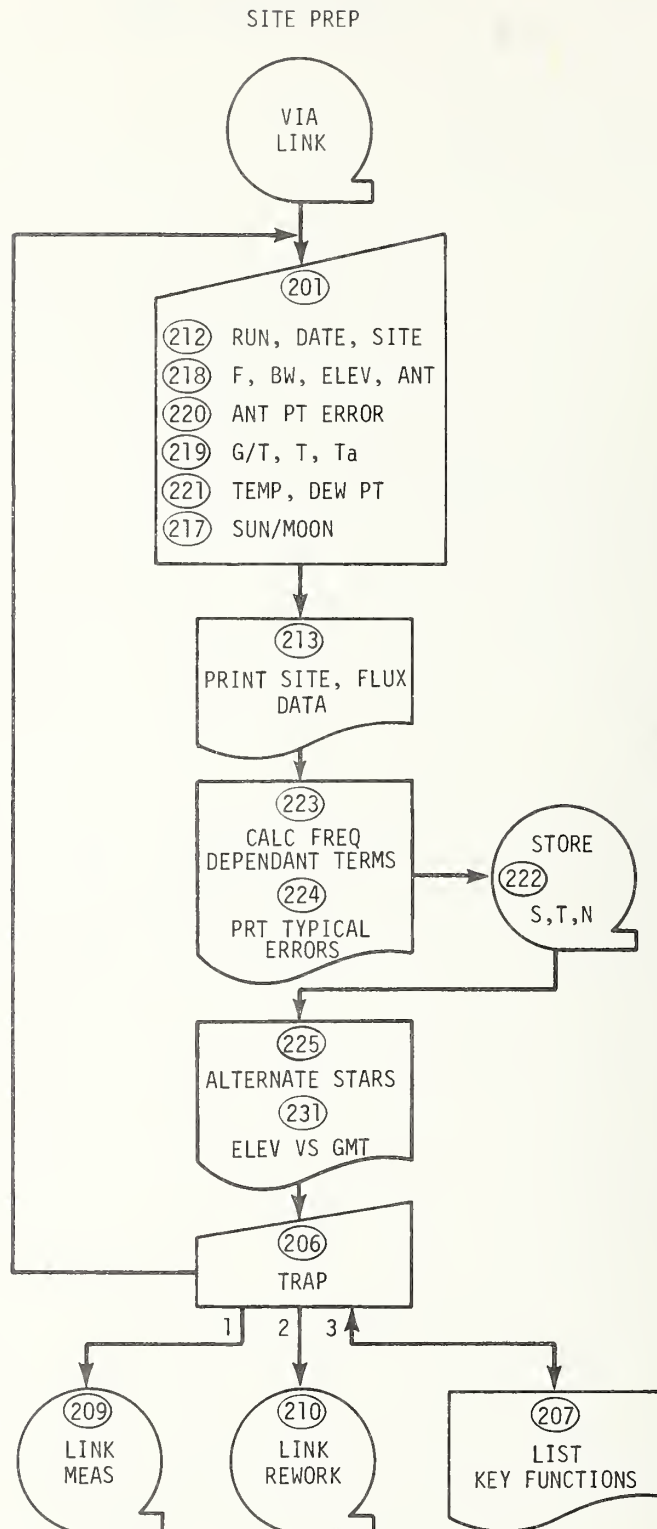
R5	4	4040	5190									
R6	4	5200										
R7	4	3980	5210									
R8	4											
R9	4											
P	5											
P1	5	3980										
Q	5	3750	4000	4075	4120	4170	4220	4270	4320	4370	4420	
		4230	4240	4320	4370	4420	4470	4520	4570	4620	4670	
		5670	5690									
Q0	5	3810	3825									
Q1	5	5320	5370	5370	5410	5450	5450	5490				
Q2	5	5330	5360	5360	5410	5440	5440	5480				
Q3	5	3792	3825	3825	3840	4065	4070	4075	4080	4080	4085	
		4085	5215									
Q4	5											
Q5	5											
Q6	5											
Q7	5											
R1	5											
R2	5											
R5	5	4420										
S	5											
S3	5											
T	5	5220										
T1	5											
T2	5											
T6	5											
T9	5											
U	5											
U1	5											
V	5											
V1	5											
V2	5											
V3	5											

# A - LOADER (cont)

V4	6		
V5	6		
V6	6		
V7	6		
V8	6		
V9	6		
W	6	5250	
W1	6		
X	6		
X1	6		
X2	6		
X5	6		
X6	6		
Y	6		
Y1	6		
Y5	6		
Z	6	3980	4150
Z1	6	8	
Z5	7		
FNA	7		
FNB	7	4180	4220
FNC	7	4195	
FND	7		
FNE	7		
FNF	7		
FNG	7		
FNJ	7	5290	5510
FRJ	7	4000	
FHK	7		
FHL	7		
FHM	7		
FHH	7	4180	4220
FHP	7		
FHQ	7	4195	4220 4250 4280 4310

1

# 8.4 B - SITE PREP





# B - SITE PREP (cont)

```

3700 H#="HBS1B.08 SITE PREP R1=R1 R2=R2"
3705 DEG
3708 CFLAG 9
3710 R(3)=803
3715 R(4)=462
3720 F2=0
3725 R=201
3730 Q=FNJ1+FNJ2+FNJ3+FNJ4+FNJ5+FNJ6+FNJ7+FNJ8+FNJ9+FNJ10+FNJ11+FNJ12
3735 GOTO 3975
3740 R=202
3745 DEF FNE(N0)
3750 REM <NBS 9913>
3755 E0=0
3760 E1=50*(1/K1-1)
3765 IF B<14 THEN 3700
3770 Q2=0
3775 GOTO 3795
3780 Q0=4.73*(5.9-B0)+5.39+500/(5.9-B0)+12+0.479)
3785 Q1=(7.12-B0)*ABS(7.12-B0)+2.04*500/(06/1.79)+2-1)
3790 Q2=0.15+0.354*(Q0+Q1)
3795 P1=2+500/(Q2+13+D(12)
3800 E2=((1-K2)*P1+D1)
3805 E3=(W/F+2E+03)+3+50
3810 E4=0.4+B0*B0/K1+K2+J(N0)+4+K8+K9
3815 Q2=60*D5*2.784/B
3820 E5=(1-(SIN(Q2*180/PI)*Q2)+12)+100
3825 E6=0.023+T(N0,11)
3830 Y=1+FN2N0*G/T
3835 Y5=Y/(Y-1)
3840 E7=500*((C9+Y5)+12+R2+12)
3845 E8=100*D8*(1/K8-1)
3850 E9=100*D9*(1/K9-1)
3855 RETURN 0
3860 R=203
3865 DEF FHO(Q)
3870 DISP "(=HC)NOW: "A#1
3875 INPUT L#
3880 IF L#=" " THEN 3890
3885 R4=L#
3890 RETURN 0
3892 DEF FNF(Q)
3893 GOTO 0 OF 4170
3894 GOTO 4870
3895 R=204
3900 DEF FNJ(Q)
3905 GOTO 0 OF 4196,5190,5765,5415,5680,4915,4450,5960,6040
3910 GOTO 0-9 OF 5740,6335,7570,6095
3915 GOTO 3975
3920 R=205
3925 DEF FNT(Q)
3930 FOR X1=1 TO X2
3935 J=AC(X1)
3940 V=MC(J,0)
3945 WRITE (15,6070)V*100
3950 MC(J,6)=MC(J,6)+V*100
3955 MC(J,7)=MC(J,7)+(V*100)+12
3960 NEXT X1
3965 PRINT
3970 RETURN 0

```

# B - SITE PREP (cont)

```

3975 PA236
3980 PRINT
3985 DISP "0=PRSTRT,1  MAIN 2=LOC WORK,3KEYS LIST";
3990 Q=FHB3+FNH0
3995 GOTO 0 OF 4055,4145,4005
4000 GOTO 3725
4005 R=207
4010 Q=FHB2
4015 PRINT TAB30,"KEYS"
4020 PRINT
4025 PRINT " 0=MAIN OPTIONS 1=PRJ#,SITE,LOC 2=F,B,A,ANT 3=ANT PT ERR"
4030 PRINT " 4=G,T,T,Ta,PWP 5=TEMP, GEN PT 6=SUN/MOON 7=PRT STAR & LOC"
4035 PRINT " 8=CALC FLUX 9=PRT I/P VALUES 10=STORE S,T,N 11=PRT ALT STARS"
4040 PRINT "12=ELEV vs GNT 13= NEW N(I,J)"
4045 Q=FHB2
4050 GOTO 3975
4055 R=208
4065 Q=S+FNH1
4070 A1=2
4075 B5=0.2
4085 C2=N0=2=1
4090 E2=0
4095 E3=30/3600
4100 E5=6/3600
4105 E7=40.349
4110 N4=30
4115 R=209
4120 R5=11
4125 IF F7 THEN 4140
4130 DISP "DATA TAPE IN PLCE";
4135 Q=FNH5+FNH1
4140 LINK #(10-5+F7)+12+4+F7+50+20
4145 P=210
4150 GOSUB 4170
4155 DISP "DATA REWORK (OFF DISK IN PLCE";
4160 Q=FNH5+FNH1
4165 LINK #(10-5+F7)+12+4+F7+50+20
4170 R=211
4175 IF STAT10 >= 4 THEN 4185
4180 REWIND
4185 RETURN 0

```

## B - SITE PREP (cont)

# B - SITE PREP (cont)

```

4450 R=213
4455 C=1900+(T(I,9)+.8125)*.5+.5
4457 DISP "FRT SITE/S.DBF DATA 0=0000"
4458 Q=FNN1
4459 IF Q=0 THEN 4795
4460 Q=FNC3+FNI5+FNS1
4465 FORMAT 5X,"SITE: N. LONG" + " N. LAT" + 10X,"ALTITUDE" + 5X
4470 WRITE (15,4465)"DATA TO BE USED FOR LNT"
4475 FORMAT 3F13.3,2F16.3
4480 WRITE (15,4475)(.4)" deg"(.5)" deg"(.0)" km"(.06)" deg"
4485 Q=FNS2+FNI5
4490 PRINT TAB34,"FLUX DATA"
4495 FORMAT F2.0,F8.0," +",F5.1," ",F4.0," GHz",F4.0," TO",F3.0
4500 FORMAT F8.2,F8.3," +",F6.3
4505 FORMAT F10.1,F7.2," +",F5.2," Yr",F35.3," +",F6.3," 1/Yr"
4510 PRINT
4515 PRINT " STAR"TAB17"FLUX in F.U."TAB40"RANGE(GHz) SIZE(min)"
4520 PRINT " SPEC INDEX"
4525 FORMAT " Epoch",8X,"Secular Decay",32X,"Secular Expansion"
4530 WRITE (15,4525)
4535 PRINT
4540 FOR I=1 TO N1
4545 TRANSFER TO(1) TO 34
4550 WRITE (15,4435)I," ",.5*(I,1)+T(I,3)/10,T(I,10)/100,T(I,19),T(I,20),
4555 WRITE (15,4500)T(I,9)/100," ",T(I,6)/1000,T(I,7)/1000
4560 IF ABS(T(I,4)+ABS(T(I,5)+ABS(T(I,15)+ABS(T(I,16)+ABS(T(I,17))=0 THEN 4580
4565 Q=T(I,5)/1000
4570 WRITE (15,4505)T(I,15)/10,T(I,16)/100,T(I,17)/100,T(I,4)/1000,Q
4575 PRINT
4580 IF 1/3-INT(1/3)#0 THEN 4500
4585 PRINT
4590 NEXT I
4595 Q=FNS1+FNI1
4600 PRINT TAB30,"PROC CONST"
4605 FORMAT " N T(N,1) S(N,1) T(N,8) T(N,13) "
4610 WRITE (15,4605)"T(N,19,20) S(N,9) T(N,6) T(N,7)"
4615 FORMAT 4X,"T(N,15) T(N,16) T(N,17)",32X,"T(N,4) T(N,5)"
4620 WRITE (15,4615)

```

# B - SITE PREP (cont)

```

4625 R=214
4630 Q=FNS2+FN13
4635 PRINT TAB30,"LOCATION & WISE DATA"
4640 PRINT
4645 FORMAT "    STAR EPOCH (DAYS AFTER 1977.0)",BX
4650 WRITE (15,4645)"SOLAR EPOCH (DAYS AFTER 1977.0)"
4655 FORMAT F11.3,F13.0,F2.1,F16.0
4660 Q=1900+(28125+T(14,9))/365.25
4665 Q1=1900+(28125+T(14,10))/365.25
4670 WRITE (15,4655)Q,T(14,9),Q1,T(14,10)
4675 Q=FNS2
4680 FORMAT 4X,"STAR:",6X,"RT.ASC",5X,"N. DEC.",9X,"LINEAR FOLZ",12X
4685 WRITE (15,4680)"PULZ HIG"
4690 FORMAT 4X,"SOLAR:  GHA @ 0 GMT  N.DEC @ 0",5X,"GHA/Hr",5X,"N.DEC/Hr",5X
4695 WRITE (15,4690)"HOR PRLX  PHASE"
4700 Q=FNS1
4705 FOR I=1 TO N1
4710 TRANSFER T(I,1) TO S(I,5)
4715 FORMAT F2.0,F9.2,"  deg",F8.2,"  deg"
4720 WRITE (15,4715)I,"  ",S(I,2),S(I,3),
4725 IF T(I,21)=0 THEN 4750
4730 FORMAT F10.3,"  deg",F8.3,"  deg",F8.3,"  deg",F4.0,"  day"
4735 WRITE (15,4730)T(I,11)/1000,T(I,12)/1000,T(I,13)/1000,T(I,14)
4740 GOTO 4755
4745 FORMAT F8.1,"  +-",F7.1,"  %",F10.1,"  +-",F5.1,"  DEG"
4750 WRITE (15,4745)T(I,11)/10,T(I,12)/10,T(I,13)/10,T(I,14)/10
4755 IF I/3-INT(I/3)≠0 THEN 4765
4760 PRINT
4765 NEXT I
4770 Q=FNS1+FN11
4775 PRINT TAB31,"PROG CONSTS"
4780 FORMAT "  N  T(N,1)      S(N,2)      S(N,3)",6X,"T(N,11)      T(N,12)",8X
4785 WRITE (15,4780)T(N,13)      T(N,14)
4790 Q=FNS2+FN13+FNS4
4795 RETURN 0
4800 R=215
4805 RESTORE
4810 READ T(14,9),S(1,2),S(2,2),S(3,2),S(4,2),S(1,3),S(2,3),S(3,3),S(4,3)
4815 DATA -730,350.578,299.654,83.256,83.515,58.6812,40.6516,21.9988,-5.4039
4820 E6=(E-28125-T(14,9))/365.25
4825 FOR I=1 TO N1
4830 IF T(I,21) THEN 4855
4835 Q=(0.012807229+5.5667917E-03*SIN(S(I,2)*TANS(I,3))*E6
4840 Q1=5.5667927E-03*COSS(I,2)*E6
4845 S(I,2)=S(I,2)+Q
4850 S(I,3)=S(I,3)+Q1
4855 NEXT I
4860 T(14,9)=E-28125
4865 GOTO 4450
4870 R=216
4875 DISP "SITE:W. LONG:"
4880 C4=FNNO4
4885 DISP "SITE:N.LAT:"
4890 C5=FNNO5
4895 DISP "SITE:ALT(KM):"
4900 C0=FNNO0
4905 RETURN 0

```

# B - SITE PREP (cont)

```

4915 R=217
4920 DISP "ENTER SUN-MOON ALIGNING DATA(1=YES)":
4925 Q=FNN0
4930 IF NOT 0 THEN 5175
4935 T[14,10]=T[12,10]
4940 SERR0R 0,4945
4945 N0=5+FNS2
4950 PRINT "FOLLOWING INPUTS ARE IN 2 PARTS:1st=deg,2nd=min"
4955 PRINT "IF DEC IS South: enter deg and min NEGATIVE"
4960 Q=FNS1+FNS8
4965 TRANSFER T[N0,1] TO S4
4970 DISP S4:"GHA @ 0 GMT":
4975 Q=FNN(SCH0,2)
4980 DISP "MIN":
4985 Q0=FNN0
4990 S[N0,2]=Q+Q0/60
4995 DISP S4:"GHA @ 12 GMT":
5000 Q=FNN(SCH0,2)+0.012*T[N0,1]
5005 DISP "MIN":
5010 Q0=FNN0
5015 Q1=Q+Q0/60
5020 IF Q1>SCH0,2] THEN 5030
5025 Q1=Q1-360
5030 T[N0,11]=1000*(Q1-SCH0,2)/12
5035 DISP "N.DEC @ 0 GMT":
5040 Q=FNN(SCH0,3)
5045 GOTO 5050
5050 DISP "MIN":
5055 Q0=FNN0
5060 IF SCH0,3]=0 THEN 5070
5065 Q0=-ABS00
5070 SCH0,3]=Q+Q0/60
5075 DISP "N.DEC @ 12 GMT":
5080 Q=FNN(SCH0,3)+0.012*T[N0,12]
5085 GOTO 5090
5090 DISP "MIN":
5095 Q0=FNN0
5100 IF SCH0,3]>= 0 THEN 5110
5105 Q0=-ABS00
5110 T[N0,12]=1000*(Q+Q0/60-SCH0,3)/12
5115 IF N0=5 THEN 5180
5120 DISP "HOR PARALLAX":
5125 Q=FNN(T[N0,13]/1000)
5130 IF Q<2 THEN 5150
5135 DISP "ERROR:HOR PARALLAX >2 DEG"
5140 Q=FNS8+FNS1
5145 GOTO 5120
5150 DISP "MIN":
5155 Q0=FNN0
5160 T[N0,13]=1000*(Q+Q0/60)
5165 DISP "AGE (DAYS)":
5170 T[N0,14]=FNN(T[N0,14])
5175 RETURN 0
5180 N0=6
5185 GOTO 4965

```



# B - SITE PREP (cont)

```

5190 R=218
5195 DISP "NEW F/BW/ELEV/ANG CORR=1-1/2%";
5200 Q=FNN0
5205 IF NOT Q THEN 5410
5210 F1=0
5215 DISP "CENTER FREQ(GHZ)";
5220 F=FNNF
5225 C1=2.997925E+08+2/(8*P1*1.00054E-23*(F+10+9)+2)
5230 D0=0.9/F+2
5235 DISP "ERR IN FREQ(%)";
5240 F0=FNNF0
5245 DISP "BANDWIDTH(MHZ)";
5250 W=FNNW
5255 DISP "ELEV(DEG)";
5260 L=FNNL
5265 DISP "ANT DIAM (FT)";
5270 D=FNN0
5275 DISP "1=APR EFF,2=ANT HPBW,3=CNVL HPBW";
5280 Q=FNN0
5285 GOTO 0 OF 5290,5310,5350
5287 GOTO 5380
5290 DISP "APERTURE EFFICIENCY";
5295 B2=FNNB2
5300 B0=3035/D/F*SQRT(B3/B2)
5305 GOTO 5325
5310 DISP "ANT HPBW(DEG)";
5315 Q=FNN(B0/60)
5320 B0=60*Q
5325 B=B0
5330 IF B>14 THEN 5380
5335 Q=4.248-1.1468*B0+0.10259*B0+2-0.0030247*B0+3
5340 B=B0+Q/(2.1468-0.20518*B0+0.0090741*B0+2)
5345 GOTO 5380
5350 DISP "CNVL HPBW(DEG)";
5355 Q=FNN(B/60)
5360 B=60*Q
5365 B0=B
5370 IF B>14 THEN 5380
5375 B0=-4.248+2.1468*B0-0.10259*B0+3+0.0030247*B0+3
5380 B2=B0/(B0*D/F/3035)+2
5385 G=B2*(D*F/0.313)+2
5390 B9=2*C1*1.38054E-23*L
5395 B0=3035/D F*SQRT(B3/B2)
5400 DISP "HPBW ERR(15,%)";
5405 D3=FNN02
5410 RETURN 0

```

# B - SITE PREP (cont)

```

5415 R=219
5435 DISP "CHANGE:1=(C/T) 2=(T/DB)";
5440 Q=FNNQ
5445 GOTO Q OF 5450,5470
5447 GOTO 5515
5450 DISP "T(E)=";
5455 T=FNNHT
5460 M=G/T
5465 GOTO 5515
5470 DISP "G/T(DB)=";
5475 Q=10*LGT(M)
5480 Q=FNNQ
5485 M=10†(Q/10)
5490 T=G/M
5515 DISP "CHANGE:1=G/TA, 2=TA";
5520 Q=FNNQ
5525 GOTO Q OF 5530,5550
5527 GOTO 5560
5530 DISP "G/TA(dB/K)";
5535 Q=FNN(10*LGT(G/H9))
5540 H9=G/10†(Q/10)
5545 GOTO 5560
5550 DISP "ADDED NOISE (K)";
5555 H9=FNNH9
5560 RETURN Q
5565 R=220
5585 DISP "ANT PT ERR:1=DEG, 2=%HPBW";
5590 Q=FNNQ
5595 IF Q=0 THEN 5680
5600 IF Q=2 THEN 5615
5605 DISP "DEG";
5610 GOTO 5620
5615 DISP "% HPBW";
5620 D5=FNN(D5+(Q=1)*D5+6000-B0*(Q=2))
5625 IF Q=1 THEN 5635
5630 D5=D5+B0/6000
5635 Q2=60+D5*2.784/E
5640 E5=(1-(SIN(Q2+180/P1)/Q2)*12)*100
5645 H1=10*LGT(1+E5/100)
5650 PRINT
5655 PRINT "ANT PT ERR corresponds to G/T data fit (3+1S/SQR(#PTS) of";H1;"dB"
5660 PRINT
5665 DISP H1;"DB:Q=TRY AGAIN";
5670 Q1=FNN1
5675 IF Q1=0 THEN 5600
5680 RETURN Q

```

# B - SITE PREP (cont)

```

5685 R=221
5705 DISP "ADJACENT TEMP (C)";
5710 Q=FNN1/AC(3)/100
5715 AC(3)=Q*10
5720 DISP "DEW PT TEMP (F)";
5725 Q=FNN1/AC(4)/100
5730 AC(4)=Q*10
5735 RETURN 0
5740 R=222
5745 DISP "STORE 5, T+M:Q=NR+C-E, T+M=INT";
5750 Q=FNB2+FNN0
5755 IF NOT Q THEN 5955
5760 NC(1,1)=R1
5765 NC(1,2)=R2
5770 NC(2,1)=R8
5772 NC(2,10)=R0
5775 NC(3,9)=R9
5780 NC(3,1)=C1
5785 NC(3,4)=C4
5790 NC(3,5)=C5
5795 NC(3,6)=C6
5800 NC(3,10)=C0
5805 NC(3,11)=C
5810 NC(4,1)=D1
5815 NC(4,2)=D2
5820 NC(4,3)=D3
5825 NC(4,10)=D0
5830 NC(4,11)=D
5835 NC(4,5)=D5
5840 NC(6,11)=F
5845 NC(7,11)=G
5850 NC(7,4)=G4
5855 NC(7,5)=G5
5860 NC(7,6)=G6
5865 NC(8,1)=H1
5870 NC(8,9)=H9
5875 NC(6,10)=F0
5880 NC(12,5)=L5
5885 NC(12,6)=L6
5890 NC(12,7)=L7
5895 NC(12,8)=L8
5900 NC(12,9)=L9
5905 NC(13,11)=M
5910 NC(14,6)=N6
5920 NC(20,11)=T
5925 NC(23,11)=W
5930 STORE DATA #0,8+Q
5935 TRANSFER P# TO T(3,1)
5940 STORE DATA #0,8+1
5945 STORE DATA #0,10+R
5950 PCWIND #0
5955 RETURN 0

```

# B - SITE PREP (cont)

```

5960 R=224
5965 MAT M=ZERO(10,20)
5970 FOR I=1 TO N1
5975 Q=C-T(I,15)/10
5980 S=T(I,6)/1E+03+H(I,4)/1E+01+G(I,6)
5985 Q2=EXP(-T(I,16)/1E+04/100+H(I,4)/1E+01+G(I,6)+T(I,16)/100)*I3
5990 I5=S*(I,13)+T(I,8)/10+Q2*(I,13)
5995 N=S+((C/T(I,18)/100)-1)*T(I,18)/100*(100)+(T(I,7)/1E+03+T(I,5)/1E+05)
6000 N3=F+(H/10)-(N/100)*F/100
6005 Q=EXP(-T(I,16)/1E+01*100+I5+H3/T(I,18)/100)*H
6010 T(I,10)=(Q-Q2)/Q2*10*I3
6015 S(I,4)=Q2
6020 M(I,1)=T(I,10)/10*I3
6025 NEXT I
6030 SFLAG 1
6035 RETURN 0
6040 R=224
6045 L0=L
6050 H0=1
6055 Q=FNC(1)+FNS2
6060 PRINT TAB(8),"TYPICAL VALUES for G-T MEASUREMENT using CAS A"
6065 Q=FNS2
6070 FORMAT "      G      I      AMPL EFF      RAD EFF      "
6075 WRITE (15,6070)"ANT HPBW      CONVL HPBW      EFF AREA"
6080 FORMAT F6.2,F8.1," L",F9.4,F10.2,F11.4," deg",F10.4," deg",F9.1," m2"
6085 WRITE (15,6080)10*LGTC," dB",1,B2,B3,B0/60,B/60,B9
6088 FORMAT /,"31N","Antenna Elev =",F8.1," deg",/
6090 WRITE (15,6088)L
6095 FORMAT 8X,"PARAMETER",50X
6100 WRITE (15,6095)"ERR TO G/T"
6105 Q=FNI2+FNK1+FNE1
6110 WRITE (15,6275)"F      FREQUENCY (GHz)      ";F,F0,E0
6115 S=T(I,10)/10
6120 WRITE (15,6285)"G      FLUX (F.U.=10*(-26)W)";S(I,4),S,S
6125 FORMAT 10X,2F8.1
6130 WRITE (15,6135)"Gant =",*(Y-I)*T," K"
6135 FORMAT 10X,2E10.3
6140 WRITE (15,6135)"G1 =",*(Y-I)*T*G," K"
6145 WRITE (15,6275)"Y      Y-FACTOR      ";Y,C8,C8*Y5
6150 WRITE (15,6220)"G-dB0 =",10*LG1(Y)," dB"
6155 FORMAT 16X,F6.1,2F6.2
6160 Q=SOR(E1+E1+E8+E3+E9+E9)
6165 Q=K1*K8*K9
6170 WRITE (15,6275)"E1      ATM CORRECTION FACTOR";K1,E1,E1
6175 WRITE (15,6235)"Corr Gain",G4*E1," dB"
6180 WRITE (15,6235)"water vapor",3.69*LG(E6+L6)," dB/cm*at3"
6185 FORMAT 10X,2F5.1
6190 WRITE (15,6185)"water vapor",3.74," cm/at3"
6195 WRITE (15,6185)"corr bias",B4," K"
6200 WRITE (15,6230)"freq eff",F0," F"
6210 WRITE (15,6185)"amb temp",H3/10," F"
6215 WRITE (15,6185)"down gain",H0/10," F"
6220 FORMAT 10X,2F7.5
6225 WRITE (15,6305)"K1      DIFFERENTIAL LOSS";(1-K8-1)*K8/E8*E0
6230 WRITE (15,6305)"K9      DIFFERENTIAL LOSS";(1-E9-1)*K9/E9*E9
6235 FORMAT 10X,2F7.4
6240 WRITE (15,6235)"1st corr",F1/3
6245 WRITE (15,6235)"2nd corr",F1/3
6250 WRITE (15,6275)"E2      CORR CORR LOSS";F2/E2*E2
6255 FORMAT 10X,"+-(C/F5.1)*100",F5.1,"%"
6260 WRITE (15,6255)F1/100
6265 FORMAT 10X,"HPBW =",F10.4,""
6270 WRITE (15,6265)L

```

# B - SITE PREP (cont)

```

6275 FORMAT 5X,F11.3," +-",F6.2," %",15,"+-",F6.2," %"
6280 WRITE (15,6275)"K3 - BANDWIDTH FACTOR " ;K3,E3,E4
6285 FORMAT 5X,F11.1," +-",F6.2," %",15,"+-",F6.2," %"
6290 PRINT "          bandwidth = 400 "MHz"
6295 FORMAT 10X,2F6.2
6300 Q2=T*(Y-1)
6305 FORMAT 5X,F5.3,F10.3," +-",F6.2," %",15X,"+-",F5.3," %",15X
6310 WRITE (15,6275)"K4 - DIFF SY-IGN TEMP " ;K4,E4,E4
6315 FORMAT 5X,F7.4,F7.3," +-",F6.2," %",14X," +-",F6.2," %"
6320 WRITE (15,6315)"K5 - ANT POINT;+";D5;" Deg) " ;K5,E5,E5
6325 WRITE (15,6295)"on G/T data title +";H1,"dB"
6330 WRITE (15,6275)"K6 - ANT POLARIZATION FACT";K6,E6,E6
6335 WRITE (15,6275)"K7 - SYSTEM RESPONSE FACT " ;K7,E7,E7
6340 WRITE (15,6295)"instr rwr resp (+";D9,"%"
6345 WRITE (15,6295)"Y<Y-1)=",Y5
6350 WRITE (15,6295)"gauss curve fit;+";A2,"%"
6355 WRITE (15,6285)"T0 - ADDED NOISE (K) " ;H9,D3,D3
6360 Q=FNI2
6365 FORMAT 5X,"TOTAL ERROR: quad sum + diffus & refr err",21X,"+-",F6.2," %"
6370 WRITE (15,6365)SQRT(3I2+(C8*Y5)I2+E1I2+E2I2+E3I2+E4I2+E5I2+E6I2+E7I2)+E8+E9
6375 Q=FNS12
6380 RETURN Q
6385 R=225
6390 IF FLAG1 THEN 6400
6395 Q=FNU8
6400 DISP "LIST ALTERNATE STARS(CO=N0)":
6405 INPUT Q
6410 IF Q=0 THEN 6990
6415 Q=FNC1+FNS5
6420 PRINT "          STAR"TAB14"FLUX in F.U.";TAB31;"T(ant)":
6425 PRINT TAB43;"K2";TAB50;"Y-factor";TAB62;"Y(dB)":
6430 FORMAT 6X,"Y1(K)"
6435 WRITE (15,6430)
6440 PRINT
6445 J=1
6450 FOR A=1 TO N1
6455 TRANSFER TO A,1 TO 5#
6460 Q=1
6465 FORMAT F2.0,F8.6," +-",F5.1," %",F9.2," K",F8.3,F11.4,F8.2," dB",E12.3
6470 Q=FNER
6475 MCA,2)=C8*Y5/100
6480 MCA,3)=E4/100
6485 MCA,4)=E2/100
6490 MCA,5)=E7/100
6495 Q2=(Y-1)*T
6500 WRITE (15,6465)A," ",54,80Y,41,T10,100/10,Q2,K2,Y,10-LGT(Y)+Q2/10
6505 NEXT A
6510 Q=FNS4

```

# B - SITE PREP (cont)

```

6515 R=226
6520 N8=AC(3)
6525 N9=AC(4)
6530 AC(1)=2
6535 AC(2)=3
6540 AC(3)=4
6545 AC(4)=5
6550 AC(5)=6
6555 X2=-1
6560 X2=X2+1
6565 IF X2=5 THEN 6575
6570 IF AC(X2+1)≠0 THEN 6580
6575 FORMAT 19X,"G/T or G/Tn MEASUREMENT ERRORS:  ELEVA = ,F5.1,"deg"
6580 WRITE (15,6575)1
6585 Q=FNE1
6590 FOR I=1 TO 5
6595 MC(1,6)=MC(1,7)+Q
6600 NEXT I
6605 PRINT
6610 AC(6)=25
6615 AC(7)=35
6620 AC(8)=45
6625 AC(9)=55
6630 AC(10)=65
6635 FOR X1=1 TO X2
6640 I=AC(X1)
6645 TRANSFER TO(I,1) TO 8#
6650 PRINT TAB(AC(X1+5));54:
6655 NEXT X1
6660 PRINT
6665 PRINT
6670 FORMAT F8.2," X",F8.2," X",F8.2," X",F8.2," X",F8.2," X",F8.2," X"
6675 PRINT "E-S    FLUX          "
6680 Q=FNT1
6685 PRINT "E-F    FREQUENCY      "
6690 Q=E0
6695 GOSUB 6705
6700 GOTO 6770
6705 FOR X1=1 TO X2
6710 WRITE (15,6670)Q:
6715 MC(X1,6)=MC(X1,5)+Q
6720 MC(X1,7)=MC(X1,7)+Q/2
6725 NEXT X1
6730 PRINT
6735 RETURN

```



# B - SITE PREP (cont)

```

6740 FOR X1=1 TO X2
6745 I=AC(X1)
6750 WRITE (15,6670)MD1,7/J:
6755 NEXT X1
6760 PRINT
6765 RETURN
6770 PRINT "E-Y    Y-FACTOR      "
6775 Q=FNT2
6780 GOTO 6815
6785 FOR X1=1 TO X2
6790 I=AC(X1)
6795 WRITE (15,6670)SQR(MD1,7/J):
6800 NEXT X1
6805 PRINT
6810 RETURN
6815 PRINT "E-K1    ATM TRANS FACT "
6820 Q=E1
6825 GOSUB 6705
6830 PRINT "E-K2    STAR SHAPE     "
6835 Q=FNT4
6840 PRINT "E-K3    BNDWD EFFECTS  "
6845 Q=E3
6850 GOSUB 6705
6855 PRINT "E-K4    DIFF SYST TEMP  "
6860 Q=FNT3
6865 PRINT "E-K5    ANTENNA POINT   "
6870 Q=E5
6875 GOSUB 6705
6880 PRINT "E-K6    ANT POLARZ      "
6885 Q=E6
6890 GOSUB 6705
6895 PRINT "E-K7    SYST RESPONSE   "
6900 Q=FNT5
6905 PRINT "E-K8    ATM DIFFUS      "
6910 Q=E8
6915 GOSUB 6705
6920 PRINT "E-K9    ATM REFAC       "
6925 Q=E9
6930 GOSUB 6705
6935 PRINT "E-Ta    NOISE ADD      "
6940 Q=D3
6945 GOSUB 6705
6950 Q=FNI(2)
6955 PRINT "TOTAL LINEAR SUM      "
6960 GOSUB 6740
6965 PRINT "TOTAL QUADRATIC SUM   "
6970 GOSUB 6785
6975 AC(3)=N8
6980 AC(4)=N9
6985 Q=FNS27
6990 RETURN 0

```

# B - SITE PREP (cont)

```

6995 R=227
7000 O=FH02
7005 GOTO 3970
7010 R=228
7015 DEF FH03
7020 A#="ABCDEFGHIJKLMN"
7025 B#="1234567890"
7030 GOTO 0 OF 7035,,405,,500
7035 A1=NC1,1J
7040 A2=NC1,2J
7045 A3=NC1,3J
7050 B=NC2,1J
7052 B0=NC2,10J
7055 B1=NC2,1J
7060 B2=NC2,2J
7065 B3=NC2,3J
7070 B7=NC2,7J
7075 B8=NC2,8J
7080 B9=NC2,9J
7085 C=NC3,1J
7090 C0=NC3,10J
7095 C1=NC3,1J
7100 C2=NC3,2J
7105 C3=NC3,3J
7110 C4=NC3,4J
7115 C5=NC3,5J
7120 C6=NC3,6J
7125 C7=NC3,7J
7130 C8=NC3,8J
7135 C9=NC3,9J
7140 D=NC4,1J
7145 D0=NC4,10J
7150 D1=NC4,1J
7155 D2=NC4,2J
7160 D3=NC4,3J
7165 D4=NC4,4J
7170 D5=NC4,5J
7175 D8=NC4,8J
7180 D9=NC4,9J
7185 F=NC6,1J
7190 F0=NC6,10J
7195 F1=0
7200 F9=NC6,9J
7205 G=NC7,1J
7210 G4=NC7,4J
7215 G5=NC7,5J
7220 G6=NC7,6J
7225 H=NC8,1J
7230 H1=NC8,1J
7235 H5=NC8,5J
7240 H9=NC8,9J

```

# B - SITE PREP (cont)

```

7245 L=NC(12,11)
7250 L1=NC(12,1)
7255 L5=NC(12,5)
7260 L6=NC(12,6)
7265 L7=NC(12,7)
7270 L8=NC(12,8)
7275 L9=NC(12,9)
7280 N=NC(13,11)
7285 N=NC(14,11)
7290 N1=NC(14,1)
7295 N5=0
7300 N6=NC(14,6)
7305 N7=NC(14,7)
7315 T=NC(20,11)
7320 W=NC(23,11)
7325 TRANSFER TC(9,1) TO P#
7330 RETURN
7335 Q=FNI5
7340 PRINT TAB(1,"PROG CONT: ")
7345 A#="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
7355 Q1=0
7360 Q2=-10
7365 FOR I=1 TO 26
7370 FOR J=1 TO 11
7375 IF NC(I,J)=0 THEN 7435
7380 Q1=Q1+1
7385 Q2=Q2+20
7390 IF Q2<55 THEN 7400
7395 Q2=10
7400 IF Q1#1 THEN 7420
7405 PRINT
7410 PRINT
7420 PRINT TAB(2,A#[I,1];B4(J,J);A#[NC(I,J)])
7425 IF INT(Q1/3)-Q1/3 THEN 7435
7430 PRINT
7435 NEXT J
7440 Q2=-10
7445 Q1=0
7450 NEXT I
7455 Q=FNC2+FNI5
7460 RETURN 0
7465 R=229
7470 DISP "WHICH PROG CONST (0=STORE/EXIT)";
7475 INPUT S#[1,2]
7480 IF S#[1,1]="0" THEN 7525
7485 I=POS(A#,S#[1,1])
7490 IF I=0 THEN 7470
7495 B#="1234567890 "
7500 J=POS(B#,S#[2,2])
7505 DISP "NEW VALUE: "00"(NC(I,J))
7510 INPUT NC(I,J)
7515 Q=FNO3
7520 GOTO 7470
7525 R=230
7530 DISP "STORE H: 0=NO,5=EXIT CASE,10=INT CASE";
7535 Q=FNI10
7540 IF Q=0 THEN 7553
7545 STORE DATA #0,10,H
7550 GOTO 7525
7553 Q=FNO1
7555 RETURN 0
7560 GOSUB 1035
7565 RETURN 0

```

# B - SITE PREP (cont)

```

7570 R=0.1
7575 DISP "ELEV OF GND POINT OUTPUTS:"
7580 Q=FNC3+FNH0
7585 IF NOT Q THEN 7700
7590 B1=H=0
7595 Q=FNC3
7600 D#="R#+.50"
7605 FOR I=1 TO N1
7610 TRANSFER TO I,1 TO 34
7615 PRINT D#(I,I) " = " I$F,
7620 NEXT I
7625 PRINT
7630 FORMAT 27%,"SOUPLE ELEV(dca)", " ",F13.0,F5.0
7635 WRITE (15,7630)0,10,20,30,40,50,60,70,80,90
7640 FORMAT 9"!....!", "!"
7645 OUTPUT (A#,7640)"";
7650 WRITE (15,7745)" GMT(chrs) " (A#) " CRS: EL "
7655 E1=-0.5
7660 E1=E1+0.5
7665 IF E1>24 THEN 7760
7670 A#(1,63)=" "
7675 A#(13,13)="!"
7680 A#(58,58)="!"
7685 FOR N0=6 TO 1 STEP -1
7690 IF SCH0,2)=0 THEN 7715
7695 Q=FNC0
7700 IF L=0 THEN 7715
7705 Q=L/2+13
7710 A#(0,0)=D#(N0,N0)
7715 NEXT N0
7720 FORMAT F4.0
7725 IF E1-INTE1 THEN 7740
7730 OUTPUT (A#(1,51),7720)E1,
7735 OUTPUT (A#(59,63),7720)E1,
7740 WRITE (15,7745)A#,
7745 FORMAT F7.2,F9.2
7750 WRITE (15,7745)L,H
7755 GOTO 7660
7760 A#(1,72)=" "
7765 OUTPUT (A#(13),7640)"";
7770 WRITE (15,7745)A#
7775 Q=FNC3
7780 RETURN 0
9000 GOTO 9999

```

# B - SITE PREP (cont)

R	1	3725	3740	3755	3770	3785	3800	3815	3830	3845	3860
		4170	4190	4450	4670	4700	4770	4815	5150	5415	5565
		5740	5960	6040	6200	6515	6995	7010	7405	7525	7570
R	1	6450	6455	6470	6475	6480	6485	6490	6500	6500	6500
		6505	7750								
R1	1	4070	5760	7020							
R2	1	3840	5765	6560	7040						
R3	1	7045									
B	1	3765	3815	5320	5330	5740	5355	5360	5365	5370	5375
		5375	5375	5635	5770	6005	7050				
B0	1	3780	3780	3785	3785	3810	3810	5300	5315	5320	5325
		5335	5335	5335	5340	5340	5340	5365	5375	5380	5385
		5630	5772	6085	7050						
B1	1	7055	7530								
B2	1	5295	5295	5300	5380	5385	5395	6085	7060		
B3	1	5300	5360	5395	6085	7065					
B4	1	6195									
B5	1	4075									
B6	1										
B7	1	7070									
B8	1	7075									
B9	1	5390	5775	6045	7080						
C	1	4455	5805	5970	7085						
C0	1	4480	4950	4960	5000	6000	7090				
C1	1	5225	5390	5700	7095						
C2	1	4085	7100								
C3	1	7105									
C4	1	4480	4890	4305	5125	7110					
C5	1	4480	4890	4890	5120	7115					
C6	1	4370	4375	4375	4380	4380	4380	4480	5795	7120	
C7	1	7125									
C8	1	6145	6145	6370	6425	7130					
C9	1	3840	6370	7130							
D	2	5270	5270	5270	5300	5385	5395	5830	7140		
D0	2	5270	5375	7140							
D1	2	5800	5710	6100	7150						

# B - SITE PREP (cont)

D2	2	3795	5405	5405	6015	6270	7155					
D3	2	5820	6355	6355	6940	7160						
D4	2	7165										
D5	2	3815	5620	5620	5620	5630	5630	5635	5835	6320	7170	
D8	2	3845	6225	7175								
D9	2	3850	6230	7180								
E	2	4195	4355	4360	4365	4820	4860					
E0	2	3755	6110	6690								
E1	2	3760	4245	4315	6160	6160	6170	6170	6370	6820	7655	
		7660	7660	7665	7725	7725	7730	7735				
E2	2	3800	4090	4275	4280	4285	4285	4335	4355	4355	6250	
		6250	6370	6485								
E3	2	3805	4095	4310	4355	6280	6280	6370	6845			
E4	2	3810	6310	6310	6370	6480						
E5	2	3820	4100	4365	4370	4370	5640	5645	6320	6320	6370	
		6870										
E6	2	3825	4820	4835	4840	6330	6330	6370	6885			
E7	2	3840	4105	6335	6335	6370	6490					
E8	2	3845	6160	6160	6225	6225	6370	6910				
E9	2	3850	6160	6160	6230	6230	6370	6925				
F	2	3805	5220	5220	5225	5230	5300	5380	5385	5395	5840	
		5985	5995	5995	6000	6110	7185					
F0	2	5240	5240	5875	6000	6110	7190					
F1	2	5210	7195									
F2	2	3720										
F3	2											
F4	2											
F5	3											
F6	3											
F7	3	4125	4140	4140	4165	4165						
F8	3											
F9	3	7200										
G	3	3830	5385	5390	5460	5490	5535	5540	5645	6085	6140	
		6500	7205									
G4	3	5850	6175	7210								
G5	3	5855	6180	7215								



# B - SITE PREP (cont)

G6	3	5860	5870	5880	5890	5900	5910	5920	5930	5940	5950	5960
H	3	7225	7235	7245	7255	7265	7275	7285	7295	7305	7315	7325
H1	3	5645	5655	5665	5675	5685	5695	5705	5715	5725	5735	5745
H5	3	7235	7245	7255	7265	7275	7285	7295	7305	7315	7325	7335
H9	3	5535	5545	5555	5565	5575	5585	5595	5605	5615	5625	5635
I	3	4540	4550	4560	4570	4580	4590	4600	4610	4620	4630	4640
		4555	4565	4575	4585	4595	4605	4615	4625	4635	4645	4655
		4560	4570	4580	4590	4600	4610	4620	4630	4640	4650	4660
		4735	4745	4755	4765	4775	4785	4795	4805	4815	4825	4835
		4835	4845	4855	4865	4875	4885	4895	4905	4915	4925	4935
		5980	5990	6000	6010	6020	6030	6040	6050	6060	6070	6080
		6085	6095	6105	6115	6125	6135	6145	6155	6165	6175	6185
		6640	6650	6660	6670	6680	6690	6700	6710	6720	6730	6740
		7450	7460	7470	7480	7490	7500	7510	7520	7530	7540	7550
I5	3	5990	6000	6010	6020	6030	6040	6050	6060	6070	6080	6090
J	3	3935	3945	3955	3965	3975	3985	3995	4005	4015	4025	4035
		7370	7375	7380	7385	7390	7395	7400	7405	7410	7415	7420
J1	3	4840	4850	4860	4870	4880	4890	4900	4910	4920	4930	4940
K	3											
K1	3	3760	3770	3780	3790	3800	3810	3820	3830	3840	3850	3860
K2	3	3800	3810	3820	3830	3840	3850	3860	3870	3880	3890	3900
K3	3	6280	6290	6300	6310	6320	6330	6340	6350	6360	6370	6380
K4	3	6310	6320	6330	6340	6350	6360	6370	6380	6390	6400	6410
K5	3	6320	6330	6340	6350	6360	6370	6380	6390	6400	6410	6420
K6	3	6330	6340	6350	6360	6370	6380	6390	6400	6410	6420	6430
K7	3	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	6435
K8	3	3810	3820	3830	3840	3850	3860	3870	3880	3890	3900	3910
K9	3	3810	3820	3830	3840	3850	3860	3870	3880	3890	3900	3910
L0	4	6045	6055	6065	6075	6085	6095	6105	6115	6125	6135	6145
L1	4	7250	7260	7270	7280	7290	7300	7310	7320	7330	7340	7350
L4	4	6175	6185	6195	6205	6215	6225	6235	6245	6255	6265	6275
L5	4	5880	5890	5900	5910	5920	5930	5940	5950	5960	5970	5980
L6	4	5885	5895	5905	5915	5925	5935	5945	5955	5965	5975	5985
L7	4	5890	5900	5910	5920	5930	5940	5950	5960	5970	5980	5990
L8	4	5895	5905	5915	5925	5935	5945	5955	5965	5975	5985	5995
L9	4	5900	5910	5920	5930	5940	5950	5960	5970	5980	5990	6000
M	4	5460	5470	5480	5490	5500	5510	5520	5530	5540	5550	5560
M1	4											

# B - SITE PREP (cont)

M2	4										
M3	4										
H	4	5995	6000	6000	6005	6085					
H0	4	3745	3810	3875	3940	4005	4045	4065	4075	4090	5000
		5000	5020	5040	5060	5070	5080	5080	5110	5110	5115
		5125	5160	5170	5170	5180	6050	7685	7690	7695	7710
		7715									
H1	4	4540	4705	4825	5070	6450	7290	7605			
H2	4										
H3	4	6000	6005								
H4	4	4110									
H5	4	7295									
H6	4	4220	4220	5910	7300						
H7	4	7305									
H8	4	6520	6975								
H9	4	6525	6980								
P	5										
P1	5	3795	3800	6260							
Q	5	3730	3865	3890	4000	4100	3905	3910	3925	3940	3990
		3995	4010	4045	4065	4135	4160	4205	4210	4235	4300
		4315	4320	4325	4395	4415	4435	4442	4458	4475	4485
		4565	4570	4585	4630	4660	4670	4675	4700	4730	4835
		4845	4925	4930	4940	4960	4975	4990	5000	5015	5060
		5070	5080	5100	5110	5125	5130	5140	5160	5200	5205
		5285	5315	5320	5335	5346	5355	5360	5440	5445	5475
		5480	5485	5530	5535	5535	5540	5550	5595	5600	5620
		5625	5710	5715	5725	5730	5750	5755	5930	5940	5945
		5975	5980	5985	6005	6005	6010	6055	6065	6105	6105
		6360	6375	6375	6440	6410	6415	6460	6470	6510	6505
		6690	6710	6715	6730	6775	6820	6835	6845	6860	6870
		6900	6910	6925	6940	6950	6985	7000	7015	7030	7335
		7515	7535	7540	7545	7553	7580	7585	7595	7695	7705
		7710	7775								
Q0	5	3780	3785	3790	4945	4990	5010	5015	5035	5065	5065
		5070	5095	5105	5105	5110	5155	5160			
Q1	5	3785	3790	4320	4325	4355	4370	4665	4670	4840	4850
		5015	5020	5025	5075	5070	5675	7055	7060	7380	7400
		7425	7425	7445							
Q2	5	3770	3790	3795	3815	3820	3820	4325	4330	4355	5335
		5640	5640	5935	6010	6010	6015	6300	6495	6500	7360
		7385	7385	7390	7395	7400	7440				
Q3	5										
Q4	5										
Q5	5										

# B - SITE PREP (cont)

Q6	5											
Q7	5											
R1	5											
R2	5											
R5	5	4120										
S	5	5980	5985	5990	6005	6100	6120	6170				
S3	5											
T	5	3830	5455	5485	5460	5490	5920	6085	6130	6140	6500	
	6495	7315										
T1	5											
T2	5											
T6	5											
T9	5											
U	5											
U1	5											
V	5	3940	3945	3950	3955							
V1	5											
V2	5											
V3	5											
V4	6											
V5	6											
V6	6											
V7	6											
V8	6											
V9	6											
W	6	3805	5250	5250	5925	6290	7320					
W1	6											
X	6											
X1	6	3930	3935	3960	6635	6640	6650	6655	6705	6715	6715	
	6720	6720	6725	6740	6745	6755	6785	6790	6800			
X2	6	3930	6555	6560	6560	6565	6570	6635	6705	6740	6785	
X5	6											
X6	6											
Y	6	3830	3835	3840	6130	6140	6145	6150	6160	6495	6500	
	6500											

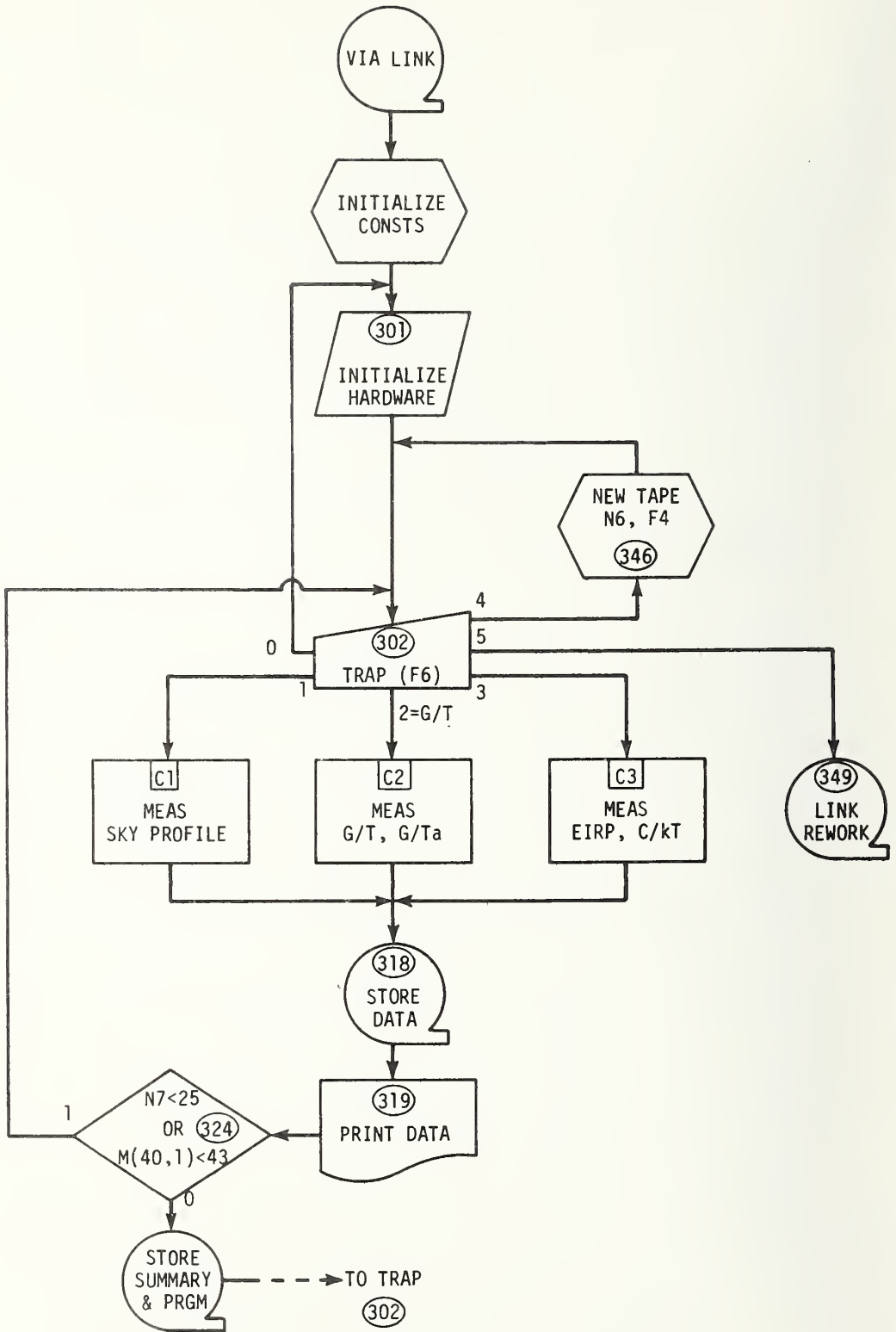
# B - SITE PREP (cont)

Y1	6										
Y5	6	3835	4000	4100	4200	4300	4400	4500	4600	4700	4800
Z	6	4085									
Z1	6	8									
Z5	7										
FHA	7	7695									
FHB	7	3990	4100	4200	4300	4400	4500	4600	4700	4800	4900
FHC	7	4460	6005	6410	7005						
FHD	7										
FHE	7	3745	6105	6410	6895						
FHF	7	3892	4605	440							
FHG	7										
FHI	7	4460	4435	4500	4600	4700	4790	6100	6200	6950	7000
		7450									
FHJ	7	3730	3730	3730	3730	3730	3730	3730	3730	3730	3730
		3730	3730	3730	3730						
FNK	7	6105									
FNL	7										
FNM	7										
FNN	7	3990	4100	4200	4300	4400	4500	4600	4700	4800	4900
		4975	4985	5000	5010	5030	5055	5090	5095	5125	5155
		5200	5220	5240	5250	5260	5270	5290	5295	5315	5355
		5440	5455	5480	5520	5535	5555	5590	5620	5670	5710
		5750	7535	7500							
FNP	7										
FNQ	7	7000	7015	7015	7050						
FNR	8										
FHS	8	4010	4045	4100	4195	4195	4230	4625	4700	4770	4790
		4730	4945	4960	5110	6005	6065	6375	6410	6510	6985
		7775									7455
FHT	8	3925	6640	6775	6835	6860	6900				
FHU	8										
FHW	8										
FHX	8										
FHY	8										
FHZ	8	3830									
FD1	9	3710	5015	5015	5015	5015	5015	5015	5015	5015	5015
		6525	6580	6585	6610	6665	6750	6750	6810	6810	6810
		6630	6640	6650	6740	6750	6775	6790			

# B - SITE PREP (cont)

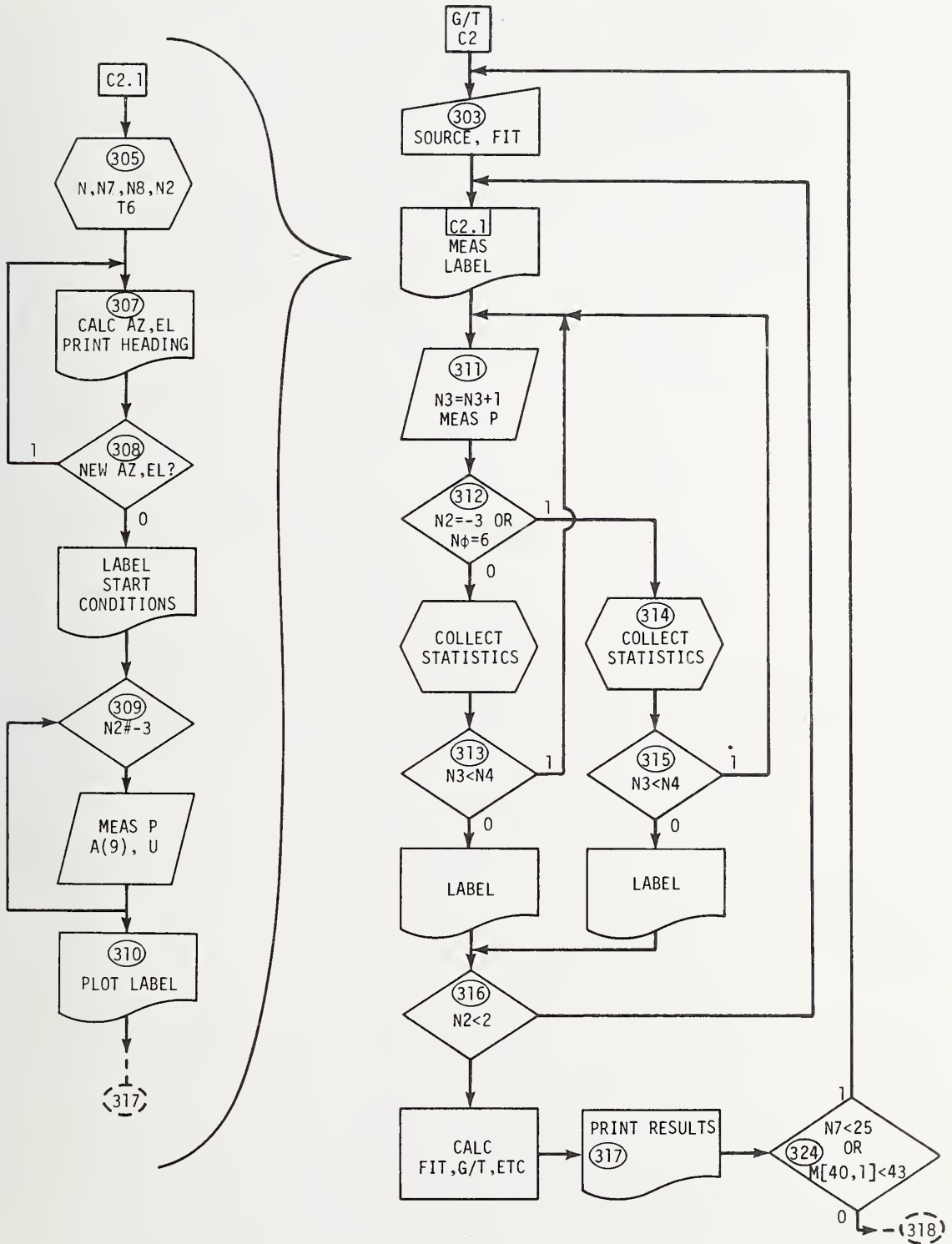
BC J	9										
CC J	9										
DC J	9										
FC J	9										
GC J	9										
HC J	9	3940	3950	3960	3970	3985	3995	4000	4005	4009	4085
		6430	6595	6705	6715	6720	6720	6750	6775	6400	6485
NC J	9	5760	5770	5780	5790	5795	5799	5799	5799	5799	5900
		5805	5810	5815	5820	5830	5835	5840	5845	5850	5855
		5860	5865	5870	5875	5880	5885	5890	5895	5900	5910
		5920	5925	5930	5935	5940	5945	5950	5952	5955	5960
		5970	5975	5980	5985	5990	5995	7100	7105	7110	7115
		7125	7130	7135	7140	7145	7150	7155	7160	7165	7170
		7180	7185	7190	7200	7205	7210	7215	7220	7225	7230
		7240	7245	7250	7255	7260	7265	7270	7275	7280	7285
		7300	7305	7315	7320	7325	7420	7505	7510	7545	
SC J	9	3810	4050	4730	4730	4810	4810	4810	4810	4810	4810
		4810	4810	4835	4835	4840	4845	4845	4850	4850	4990
		5000	5020	5030	5040	5070	5080	5110	5930	5955	5990
		6015	6120	6500	7600						
TC J	9	3825	4195	4360	4435	4545	4550	4550	4550	4550	4555
		4555	4555	4560	4560	4560	4560	4565	4570	4570	4570
		4570	4660	4665	4670	4670	4710	4725	4735	4735	4735
		4750	4750	4750	4770	4810	4820	4830	4860	4935	4965
		5000	5030	5060	5110	5125	5160	5170	5170	5335	5940
		5980	5980	5985	5990	5990	5995	5995	5995	5995	6005
		6010	6020	6115	6465	6500	6645	7325	7610		
XC J	9										
H#	3700										
FN0	3865	4235	4260	4300	4395	4415	4435				
A#	3870	3885	4230	4240	4245	4255	4265	4270	4275	4285	4295
	4305	4310	4330	4360	4410	4420	4430	4440	7020	7345	7420
	7485	7645	7690	7670	7675	7680	7710	7730	7735	7740	7760
	7765	7770									
L#	3875	3880	3885								
P#	4230	4240	4255	4265	4270	4285	4295	4300	4300	4400	4410
	4420	4430	4440	5935	6035						
S#	4545	4550	4710	4710	4710	4710	4335	6455	6500	6615	6650
	7475	7480	7485	7500	7610	7615					
L	5360	5260	6045	6090	6590	7245	7700	7705	7760		
B4	7025	7420	7445	7500							
D4	7000	7615	7710								

# 8.5 C - MEAS

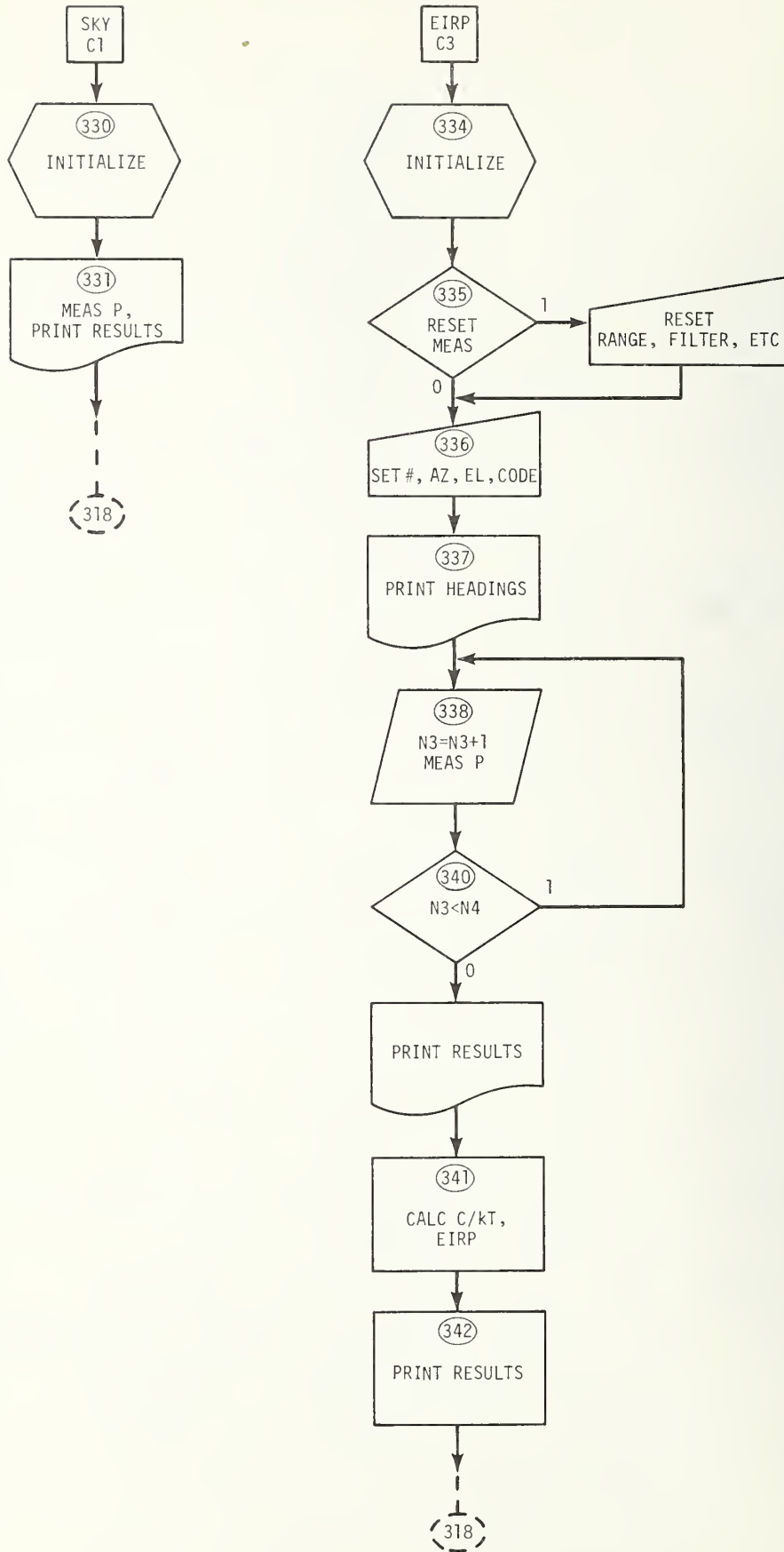




C - MEAS (cont)



C - MEAS (cont)



## C - MEAS (cont)

# C - MEAS (cont)

```

4010 B#="#"
4015 GOTO 4025
4020 B#="+"
4025 Q=0
4030 A#=""
4035 A#[1,72]=" "
4040 A#[32,32]=" "
4045 FORMAT F3.0
4050 FORMAT F8.4
4055 OUTPUT (A#[1,2],4041)M3
4060 OUTPUT (A#[57,64],4056)1-100-1+100,
4065 OUTPUT (A#[65,72],4050)5+V9-2+V-V0,
4070 IF Q<1 OR Q>68 THEN 4090
4075 A#[Q,Q]=B#[1,1]
4080 WRITE (15,4045)A#
4085 N3=ABS(N3)
4090 FORMAT F9.5
4095 WRITE (15,4090)P
4100 IF N3<N4 THEN 4120
4105 A#=""
4110 OUTPUT (A#,3950)""
4115 PRINT TAB6;A#
4120 RETURN 0
4125 DEF FHT(I)
4135 Q=FNR3
4140 Q=INT(100+Q)/3600-100+INT(Q/101)+-3/3*INT(Q/100)-INT(Q/90)
4145 IF FLAG5 THEN 4160
4150 T1=Q
4155 SFLAG 5
4160 IF I#1 THEN 4170
4165 E1=Q+E3+N4+E5/2+Q/11)*24
4170 RETURN Q+(Q/T1)*24
4175 DEF FNG(Q)
4180 IF Q=-99 THEN 4260
4195 IF Q=0 THEN 4205
4200 M1=M2=M3=N9=V1=V2=V3=V4=V5=V6=0
4205 N9=N9+1
4210 M1=M1+X2
4215 M2=M2+X
4220 M3=M3+P
4225 V1=V1+X2+2
4230 V2=V2+X+2
4235 V3=V3+X*X2
4240 V4=V4+P*X2
4245 V5=V5+P*X
4250 V6=V6+P+2
4255 GOTO 4340
4260 G[1,1]=V1-M1+2/N9
4265 G[1,2]=G[2,1]=V3-M1-M2/N9
4270 G[2,2]=V2-M2+2/N9
4275 MAT C=INV(G)
4280 Y[1]=V4-M1*M3/N9
4285 Y[2]=V5-M2*M3/N9
4290 V6=V6-M3+2/N9
4295 MAT F=C*Y
4300 X2=(M3-F[1,1]*M1-F[2,1]*M2)/N9
4305 V4=1/(4*F[1,1])
4310 V5=-2*V4+F[2,1]
4315 Q=X2-V5+2/4/V4
4320 R2=V6-F[1,1]*Y[1]-F[2,1]*Y[2]
4325 W1=SQR(R2/(N9-2))-Q
4330 IF V4*(2-Q) <= 0 THEN 4340
4335 I=SQR(8.7*V4*(2-Q)+N4+E5/2)+E1
4340 RETURN 0

```

# C - MEAS (cont)

```

4350 DEF FNN(Q)
4360 GOTO Q OF 4465,4505
4365 IF F3=0 THEN 4410
4370 DISP "TEMP(F)":
4375 Q=FNB3+FNN(RC3)/10
4380 RC3=10*Q
4385 DISP "REL HUMID (%)":
4390 Q=FNN(RC5)/10
4395 RC5=10*Q
4400 RC4=10+((RC3)/10+10.78-((RC3)/10-32)/9+273.15)
4405 GOTO 4425
4410 RC3=1000+(FNN110+FNN128+FNN9)
4415 RC4=1000+(FNN109+FNN2)
4420 RC5=1000+EXP(0.111*((RC4)/10+10.78-(RC3)/10+10.78))
4425 IF N2#-3 THEN 4460
4430 DISP "CLOUDS(0 TO 9=RAIN)":
4435 Q=FNB2+FNN(INT(RC5)/100)
4440 RC6=100+Q
4445 DISP "WIND (MPH)":
4450 Q=FNN0
4455 RC6=RC6+Q
4460 RETURN 0
4465 FORMAT 5X,"TEMP          DEW PT.          REL HUMD          WATER DENS          "
4470 WRITE (15,4465)"CLOUD COVER          WIND"
4475 FORMAT F9.1," F",F10.1," F",F11.1," %",F10.1," gm/wt3",2F10.0," mph"
4480 Q=100+(RC6)/100-INT(RC6)/100
4485 L7=255+EXP(0.111*((RC4)/10+10.78)/65+(RC3)/10-32)/9+273.15)
4490 WRITE (15,4475)RC3/10,RC4/10,RC5/10,L7,INT(RC6)/100,Q
4495 PRINT
4500 RETURN 0
4505 DISP "TEMP/HUMID:0=AUTO,1=MANL ";
4510 F3=FNB3+FNNF3
4515 RETURN 0
4520 DEF FNU(Q)
4530 I=C2
4535 E0=E2
4540 P=FNPC3
4545 IF E2#E0 THEN 4535
4550 RC7=5000*Q1
4555 J=5*V9*(2*V-V9)
4560 E0=E2
4565 IF C2 THEN 4580
4570 C2=1
4575 GOTO 4590
4580 C2=0
4585 E2=E2+5
4590 Q=FNPC3
4595 C2=1
4600 E2=E0
4605 Q=V9*(2*V-V9)/Q1+RC7/1000/Q
4610 IF Q>1 THEN 4620
4615 Q=1/Q
4620 RC8=10+4+LOG(Q/A3)
4625 FORMAT " BRG PWR      BRG PWR/a      PWR+a/STD      STD      Ta#      "
4630 WRITE (15,4625)"MANL      PRGB      STD CK      FLTR"
4635 FORMAT F7.4," %W",F9.4," %M",F9.0,F11.4,3F6.0," dB",F9.4," dB",F5.0,
4640 WRITE (15,4635)RC7/1000,J,C2,RC,C2,E6," dB",E2,RC/1000,P1
4642 Q=1000+J/RC7
4645 IF E2>0 AND E2<11 AND Q<1 AND 1/0<4 AND ABS(RC8)<500 THEN 4670
4650 DISP "NOT NORMAL(1=NO,0=Y)":
4655 Q=FNB3+FNN0
4660 IF Q=0 THEN 4670
4665 Q=FND0+FND1+FND2+FND3+FND4+FND5+FND6+FND7
4670 RETURN 0

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C - MEAS (cont)



# C - MEAS (cont)

```

5220 R=311
5225 N3=N3+1
5230 T2=FNPC3
5235 IF FNR3<T2 THEN 5235
5240 IF INT(T2/0.02)-T2<0.02 THEN 5240
5245 P=FNPC3
5250 D(T6,N3+7)=LOG(P/0.1)+1014
5255 Q=FN7(N3)
5260 P=312
5265 IF N2=-3 OR N3=6 THEN 5265
5270 Q1=N3-S3+R5/2+0.5
5275 X=2*(N3-S3)-N4
5280 X2=X+2
5285 IF Q1<1 OR Q1>R5 THEN 5285
5290 Q=FNQCN9
5295 IF N3<N4 THEN 5220
5300 R=313
5305 P=FNQ(-99)
5310 D(T6,3)=N4
5315 D(T6,6)=LOG(P/0.1)+1014
5320 Q0=H-V5+N4+E5/2+E1
5325 D(T6,7)=100*(S3+V5+N4+2)
5330 IF N2#0 THEN 5330
5335 M(N8,1)=INT(10*L+0.5/10+N0/100)
5340 M(N8,6)=F
5345 M(N8,4)=I
5350 Q=1
5355 PRINT
5360 FORMAT "#FIT      ANT HPBM      T"
5365 WRITE (15,5360)T1,"  ",N2,NR,ANG,OFFSET,  PEAK#,  LEVEL:  "16#"
5370 FORMAT "F3.0,F10.3,"  " dea",F10.4,"+-",F6.2,"%"
5375 WRITE (15,5370)N9,"  ",P,100-M1,
5380 FORMAT "F11.4,"  " dea",F10.3+2F6.1
5385 WRITE (15,5380)Q0,D(T6,7)/100-100*(P-R1)/(R1*(Y-1)),"%"
5390 Q=FN54
5395 PRINT TAB20,"increase M# BIAS if peak before PEAK#"
5400 PRINT TAB20,"decrease DECL BIAS if 1st cut too deep"
5405 GOTO 5490
5410 R=314
5415 M1=M1+P
5420 V1=V1+P12
5425 R=315
5430 IF N3<N4 THEN 5220
5435 Z=M1/N3
5440 PRINT
5445 PRINT
5450 FORMAT "9%,"T15L15,"1st cut",S10L15,"9%,"NEAR",8%,"#PTS",9%,"T",9%,";"
5455 WRITE (15,5450)S#
5460 Q=100+80P*((V1-M1+2*N3)-(N3-1))/2
5465 FORMAT "F16.4,F14.2,"  "1st cut",F11.2,"  ",F9.0,F13.1
5470 WRITE (15,5465)Z,0.0/500*(N3-1)/(N3+2+H9)
5475 PRINT
5480 IF N2#-3 THEN 5490
5485 B5=2-80/SINL
5490 Q=FN5(21-N4+65*INT((N4+27)/65))

```

# C - MEAS (cont)

```

5495 R=316
5500 IF N2<2 THEN 4900
5505 Q1=N2=0
5510 FOR J1=0 TO 6
5515 X=DC J1,5J 1000
5520 X2=X+2
5525 P=U*EXP(DC J1,6J 10+4)
5530 Q=FNGH9
5535 NEXT J1
5540 V7=FNG(-99)
5545 Y=V7/Z
5550 X1=FNZ(H9)
5555 Q4=K+SCN8,4J/2+1,4685*Y+0.5
5560 MCN8,8J=Q4/(Y-1)-B4/B3
5565 MCN8,9J=Q4/K1/(Y-1)+3-B9
5570 M=(Y-1)/X1
5575 MCN8,2J=10*LGTM
5580 Y=(V7+W1)/Z
5585 MCN8,3J=10*LGTC(V7-Z),X1)
5590 MCN8,7J=V5
5595 R=317
5600 Q=FNC1+FHM1+FNI5+FNS1
5605 PRINT TAB22;"BEST FIT FOR THE 5 CURS" Ta="H3;"K"
5610 PRINT
5615 Q=I*E8/N4+E5+2
5620 MCN8,5J=Q
5625 WRITE (15,5360)S#;"<Ta DECL OFFSET T/Ta ELEV RUN SET"
5630 WRITE (15,5370)N9,Q,V7,100+W1
5635 FORMAT F10.3;" dea" F3.4;"K" F6.1;" dea" F4.0,F5.0
5640 WRITE (15,5635)V5,Z,MCN8,1J,N6,H7
5645 Q=FNS2
5650 FORMAT 10%,"G",17%,"G T",18%,"HEF",15%,"NUF",4,2F12.2,F5.2,2F12.3;" K/M12"
5655 Q=MCN8,3J+10*LGTH9
5660 Q2=ABS((Y-1)/X1-M)/M*10*LOG10
5665 WRITE (15,5650)Q," dB",MCN8,2J," + " Q2," dB",MCN8,6J," K/M12",MCN8,9J
5670 Q=FNS2+FNI5
5675 PRINT TAB23;"100*(Dm-H-FIT) (MAG dT("S#;")/Ta)"
5680 PRINT
5685 FORMAT 10%,"CUT",5F10.0,4,F24.1,"C",5F9.1
5690 REDIM Y(5)
5695 FOR I=2 TO 6
5700 X=DC I,5J 1000
5705 P=U*EXP(DC I,6J 10+4)
5710 Y(I-1J)=100*(P-(X-V5)*2/4*(V4-V7)/(Y7-Z)
5715 NEXT I
5720 WRITE (15,5685)-2,-1+3,1,2,Y(1J),Y(2J)," ",Y(3J)," ",Y(4J)," ",Y(5J)," "
5725 Q=FNS2
5730 REDIM Y(2)
5735 PRINT "TO REPLACE H CUT:(1) KEY 1 then (2) KEY 100"
5740 R=318
5745 PRINT
5750 DISP "REMARKS:"
5755 Q=FNS5
5760 INPUT A#
5762 D#=A#(1,35)
5764 E#=A#(26,33)
5765 PRINT
5770 MC40,1J=MC40,1J+1
5775 Q=2*H7+12
5780 Q6=MC40,1J+8+F7+33
5785 FORMAT "STORE: INT FILE (F3.0) IN "EXT FILE" F3.0,15;"EXT SE#;"F3.0,15;"
5790 WRITE (15,5785)Q,Q6,MC40,1J
5795 STORE DATA Q
5800 STOP DATA #5,END

```



## C - MEAS (cont)

```

6100 R=326
6101 DISP "TAP( )";
6105 H9=FNNH9
6110 GOTO 4900
6115 R=327
6116 DISP "HR ANG BIA = 0°";
6120 H=FNNH
6125 DISP "DECL BIAS(DEG) = ";
6130 L1=FNNL1
6135 DISP "AZ BIAS(DEG) = ";
6140 X5=FNNX5
6145 DISP "EL BIAS(DEG)" ;
6150 M6=FNNM6
6155 GOTO 4900
6160 R=328
6161 DISP "G/T A(dB)";
6165 B7=FNNB7
6170 H9=G/101(B7/10)
6175 GOTO 4900
6180 R=329
6181 DISP "T/Ta @ 90°";
6185 B5=FNNB5
6190 DISP "CSC COEF";
6195 B6=FNNB6
6200 GOTO 4900
6205 R=330
6210 Q=FNF1+FNE0
6220 N9=X=0
6225 DISP "SKY GMT(CHPS+45)RST STOP STEP";
6230 INPUT J5,N3,J1
6235 R=331
6240 Q=FND0+FND1+FNM0+FNC5+FNMA(FN13-FN-2)+FNU1
6245 O=FNS2
6250 PRINT TAB30,"SET # AND J1"
6255 O=FNS2
6260 PRINT "AZ","EL", ",","GMT",J1,":00"
6265 PRINT
6270 FOR E1=15 TO N3 STEP J1
6275 PRINT FNA(N0),L;
6280 DISP "READY";
6285 INPUT R#
6290 E0=E2
6295 P=FNPC3
6300 IF E0-E2 THEN 6320
6305 PRINT TAB45,E1,P
6310 X=L
6315 X2=1 SINL
6320 O=FMGN9
6325 NEXT E1
6330 Q=FMGC-99
6335 B6=YD10-GI1*10
6340 B5=(M3-B6*M1)*N9
6345 FORMAT "(S.XXX.D1)",B5,B6,FN10,X,FN4,"END"
6350 WRITE (15,(135),(14))
6355 Q=FN3(38-3*N9+65-100*(1-N9)/10)+(Q-1)

```

# C - MEAS (cont)

```

6360 R=332
6365 MCN8,1]=N0/100
6370 MCN8,2]=B5
6375 MCN8,3]=B6
6380 MCN8,4]=FNT2
6385 MCN8,5]=AC3/10
6390 MCN8,6]=F
6395 MCN8,7]=L7
6400 MCN8,8]=INT((H3-I5)/J1+1)
6405 MCN8,10]=N6+H7/100
6410 GOTO 5740
6415 R=333
6420 FORMAT /,8X,"BIRD CODE P-Pa PWR dPadd",,,"RUN/SET STAR ELEV
6435 WRITE (15,6420)" G-T G-To HFBW#1 HFBW#2 FREQ DECL HEF NUF"
6440 PRINT
6445 FORMAT F6.2,F5.1,F8.3,2F5.3,4F7.3,F8.3
6450 I=0
6455 I=I+1
6460 IF I>39 THEN 6525
6465 Q=MC1,1]
6470 IF Q=0 THEN 6455
6475 Q0=MC1,6]
6480 Q1=MC1,7]
6485 Q2=MC1,8]
6490 J=MC1,9]
6495 Q3=ABSQ
6500 TRANSFER TO100+Q3-10*(INT(10+Q3)/10) TO 8#
6505 WRITE (15,6445)MC1,10],,,"8#",Q,MC1,2],MC1,3],MC1,4],MC1,5],Q0,Q1,Q2,J
6510 IF INT(1/3)-1/3 THEN 6520
6515 PRINT
6520 GOTO 6455
6525 RETURN 0
6530 R=334
6535 N0=7
6540 N3=0
6545 E2=6
6550 H=L1=0
6555 S#="BIRD"
6560 MAT A=ZER
6565 MAT D=ZER
6570 R=335
6575 IF FLAG1=0 THEN 6595
6580 DISP "RESET MEAS(1-YEL)"
6585 Q=FNN0
6590 IF Q#1 THEN 6685
6595 F9=F2=F5=Q5=E9=Z5=F0=Q6=0
6600 IF FLAG1=0 THEN 6670
6605 PRINT TAB15,"MEAS RESET"
6610 Q=FNS1+FNJ13+FNS2
6630 DISP "SLANT RANGE,1070000"
6635 E7=FNNE7
6640 DISP "RCR GAIN SLOPE (Hz)"
6645 P1=FNNP1
6650 DISP "AZ(DEC)";
6655 A=FNNA
6660 DISP "EL(DEC)";
6665 L=FNHL
6670 SFLAG 1
6675 E4=1
6680 Q=FNJ18

```

# C - MEAS (cont)

```

6685 R=336
6690 N3=0
6695 Q=FNF0+FNM0
6700 Q=FNX68+FNX67
6705 L$="CODE:0=SKY,1=-F, 2=KUR @ F, 3=+F,4=OTHER
6710 DISP L$:
6715 B1=FNNB1+FNJ9+FNJ15+FNJ6
6720 T=(B5+B6*(1/SINL-1))*H3
6725 DISP "# MEAS PTS":
6730 N4=FNB2+FNNH4
6735 IF N4<73 THEN 6765
6740 DISP "ERROR: #MEAS<73":
6745 Q=FNB7+FNW2000
6750 PRINT
6755 GOTO 6725
6760 R=337
6765 Q=FNOC3+FNM1+FNI3+FNS3+FND0+FND1+FNU1+FNS2+FNK1
6770 PRINT TAB20,L$:
6775 Q=FNS2
6780 FORMAT " SLANT RANGE AZIMUTH ELEV RCR F BNDWD "
6785 WRITE (15,6780)" CODE RUN SET"
6790 FORMAT E12.3,"Km",F12.2,F9.2,F11.4,F7.1," MZ",F8.0,2F5.0
6795 WRITE (15,6790)E7*1E+06,A,L,F,W,B1,N6,N7
6800 M1=M2=M3=N3=V1=V2=V3=0
6805 Q=FNS3
6810 FORMAT " FILTER# NOISE BW 1st CONST 2nd CONST "
6815 WRITE (15,6810)"GAIN SLOPE EQUIV BW"
6820 Q=15+INT(A1/2-0.5)
6825 Q0=1+5*(A1/2=INT(A1/2))
6830 W=NC0,Q0]*(1+P1*NC0,Q0+1)+P1+2+NC0,Q0+2)
6835 FORMAT F5.0,F12.3," MHz",F10.4," MHz",F10.4,F11.4,F9.3," MHz"
6840 WRITE (15,6835)A1,NC0,Q0],NC0,Q0+1],NC0,Q0+2]," MHz↑2",P1,"/MHz",W
6845 Q=FNS3
6850 FORMAT " N3 P/P(ADD) PWR#1 PWR#2 MANUAL "
6855 WRITE (15,6850)"PROG TIME(HRS)"
6860 Q=FND1+FNS1
6865 R=338
6870 N3=N3+1
6875 E1=FNT1
6880 I=FNX100+FNX24+FNR2
6885 R5=E2
6890 P=FNPC3
6895 IF R5-E2 THEN 6885
6900 DC1,N3+2]=LGT(5+Q1)*1E+04
6905 DC2,N3+2]=LGT(5+Q3)*1E+04
6910 IF P>0 THEN 6920
6915 P=1
6920 DC3,N3+2]=LGTP*1E+04
6925 Q=E1
6930 IF E1<32 THEN 6940
6935 Q=E1-24
6940 DC4,N3+2]=Q*1E+03
6945 DC6,N3+2]=E2+E6
6950 FORMAT F5.0,F13.5,2F13.2,F6.0," dB",F6.0," dB",F12.5
6955 IF Q0=0 THEN 6965
6960 DC5,N3+2]=LGT(ABSQ0)*1E+04
6965 Q1=5*Q1*10↑((E2+E6)/10)
6970 Q3=5*Q3*10↑((E2+E6)/10)
6975 WRITE (15,6950)N3,P,Q1,Q3,E5,E2,E1
6980 IF N3/3=INT(N3/3) THEN 6990
6985 PRINT

```

# C - MEAS (cont)

```

6990 R=333
6995 M1=M1+P
7000 M2=M2+D1
7005 M3=M2+(Q3-Q1)
7010 V1=V1+P12
7015 V2=V2+Q1+2
7020 V3=V3+(Q3-Q1)+2
7025 R=340
7030 IF N3<N4 THEN 6005
7035 Z=M1/N3+FNS3
7040 FORMAT ("PTS",10,"P=F13.5,Q",1,"FWR#1",10,"FWR#2=FWR#1+QWR")
7045 WRITE (15,7040)
7050 FORMAT (F3.0,F13.5," ",F5.1," ",F5.1," ",F13.5," ",F5.1," ",F5.1," ",F5.1)
7055 Q1=100*SQR((V1-M1)/N3+(V2-M2)/N3)
7060 Q2=100*SQR((V2-M2)/N3+(V3-M3)/N3)
7065 Q=100*SQR((V3-M3)/N3+(V1-M1)/N3)
7070 WRITE (15,7050)N3,M1,N3,Q1," ",N2,N3,Q2,M3,N3,Q," ",B1
7075 Q=FNS(25-4*N4/3+65*INT((4*N4/3+35)/65))
7080 R=341
7085 GOTO B1 OF 7100,7120,7130
7090 F9=M1/N3
7095 GOTO 7145
7100 F2=M1/N3
7105 F5=M2/N3
7110 Q5=N3/N3
7115 GOTO 7145
7120 F9=M2/N3
7125 GOTO 7145
7130 Z5=M1/N3
7135 F8=M2/N3
7140 Q6=M3/N3
7145 AC1J=100+N6+N7
7150 AC2J=F*1000
7155 AC3J=B1
7160 AC9J=0
7165 AC10J=LGT(E7*1000)
7170 DC1,1J=(R-100)*100
7175 DC2,1J=Q2
7180 DC3,1J=N4
7185 DC4,1J=LGT(M1/N3)+1E+04
7190 DC5,1J=LGT(M2/N3)+1E+03
7195 IF N3>0 THEN 7205
7200 N3=N3
7205 DC6,1J=LGT(M3/N3)+1E+03
7210 DC1,2J=L+100
7215 DC2,2J=E6
7220 DC3,2J=N+10
7225 DC5,2J=P1+1E+04
7230 MCN8,1J=B1+0.07
7235 MCN8,6J=F
7240 B8=(F5+F8)/2
7245 Q7=(Q5+Q6)/2
7250 IF F5 AND F8 THEN 7265
7255 B8=F5+F8
7260 Q7=Q5+Q6
7265 MCN8,4J=E9
7270 Q=(F2+Z5)/2
7275 IF F2 AND Z5 THEN 7285
7280 Q=F2+Z5
7285 MCN8,2J=M1/N3
7290 MCN8,3J=M2/N3
7295 MCN8,4J=M3/N3
7300 MCN8,8J=0
7305 MCN8,9J=0
7310 MCN8,10J=N6+N7+100

```



## C - MEAS (cont)

# C - MEAS (cont)

```

7625 R=347
7630 DISP "FLTR:1=2000,2=1000,3=2000,4=5000";
7635 A1=FHHAI
7640 DISP "MANL ATNGB=";
7645 EC=FHHES
7650 RETURN 0
7655 R=348
7656 DISP "STAR#";
7660 N0=FHHN0
7665 B1=0
7670 TRANSFER TEND,11 TO S4
7675 FORMAT "AZ=";F7.2;" EL=";F7.2;" BIAS:HR,DLC,AZ,EL ",5F7.3
7680 E1=ENT0+3.3600
7685 WRITE (15,7675)FHHN0+X5,L+X6,H,B1,X5,X6," "S#;
7690 DISP "AZ="A" EL="L
7695 WAIT 2000
7700 PRINT
7705 GOTO 7680
7710 R=349
7715 DISP "RWK TP IN PLACE";
7720 Q=FNB2+FHH1
7725 LINK #(10-5+F7)+12+4+F7,50,50
7730 R=350
7735 MAT A=ZER
7740 MAT D=ZERCG,751
7742 TRANSFER TEND,11 TO S4
7743 Q=N0
7745 DISP "SOURCE:";S#;
7750 N0=FNB3+FHHN0
7755 IF Q#N0 THEN 7742
7760 RETURN 0
7765 R=351
7770 N7=N7+1
7775 DISP S#;" SET#";
7780 N7=FHHN7
7785 N=6*N7
7790 N8=N7+F4
7795 N2=-3
7800 RETURN 0

```

# C - MEAS (cont)

R	1	4700	4790	4815	4815	4800	4975	5010	5065	5180	5210
		5220	5260	5300	5410	5425	5495	5555	5740	5805	5835
		5945	5990	6035	6075	6100	6115	6160	6180	6205	6235
		6415	6530	6570	6685	6700	6865	6990	7025	7080	7345
		7520	7535	7550	7625	7655	7710	7730	7765		7415
R	1	4990	5040	5130	6650	6655	6795	7170	7485	7490	7490
		7495	7690								
R1	1	3720	4640	6820	6825	6825	6840	7635	7635		
R2	1										
R3	1	4620	4640								
B	1	4955	5040	7465							
B0	1										
B1	1	3730	4955	4970	5040	5165	6715	6715	6795	7070	7085
		7155	7230	7665	7685						
B2	1	7455									
B3	1										
B4	1	5560									
B5	1	5000	5050	5485	6185	6185	6340	6350	6370	6720	
B6	1	3735	5000	5050	5485	6195	6195	6335	6340	6350	6375
		6720									
B7	1	6165	6165	6170							
B8	1	7240	7255	7320	7330	7335	7360				
B9	1	5005	5560	5565	7460						
C	1	7475	7485								
C0	1										
C1	1	5005	7445	7460							
C2	1	4530	4565	4570	4500	4595	4640	7175	7540	7540	
C3	1	4540	4590	4640	5195	5245	6295	6890	7525	7525	
C4	1										
C5	1										
C6	1										
C7	1										
C8	1										
C9	1										

# C - MEAS (cont)

D	2	7455	7465									
D0	2	7450										
D1	2											
D2	2											
D3	2											
D4	2											
D5	2											
D8	2											
D9	2											
E	2	7315	7330	7340	7350							
E0	2	4535	4545	4560	4580	6290	6300					
E1	2	4165	5040	5060	5135	5150	5155	6270	6305	6325	6375	
		6925	6930	6935	6975	7680						
E2	2	4535	4545	4560	4585	4585	4600	4640	4645	4645	6290	
		6300	6545	6885	6895	6945	6965	6970	6975			
E3	2	4165	4980	5110								
E4	2	6675										
E5	2	4165	4335	5040	5060	5085	5110	5320	5615			
E6	2	3740	4640	6945	6965	6970	6975	7215	7645	7645		
E7	2	6635	6635	6755	7165	7318	7360					
E8	2	4335	5320	5615								
E9	2	6595	7120	7265	7320	7330	7335					
F	2	5175	5340	6390	6735	7150	7235	7318	7425	7430	7435	
		7445	7450	7455	7465	7475	7485	7485	7490			
F0	2	7490										
F1	2	7318	7330	7400								
F2	2	6595	7160	7270	7275	7280						
F3	2	4365	4510	4540								
F4	2	4735	4935	7615	7750							
F5	3	7595	7165	7340	7350	7355						
F6	3	4800	4905	5020	6040							
F7	3	5780	5950	7725	7725							
F8	3	6595	7105	7240	7250	7255						
F9	3	6595	7490	7500	7505	7400						
G	3	3850	4275	4275	4305	4470	4740	4810	4860			

# C - MEAS (cont)

G4	3											
G5	3											
G6	3											
H	3	5110	5200	5100	5100	6450	7685					
H1	3											
H5	3											
H9	3	3860	3875	3860	3870	5605	5655	6105	6105	6170	6170	
		7340										
I	3	3910	3915	3925	3935	3940	4125	4160	4335	4530	4595	
		5345	5375	5615	5635	5700	5705	5710	5715	5860	5875	5900
		6450	6455	6455	6460	6465	6475	6480	6485	6490	6505	6505
		6505	6505	6505	6510	6510	6880	7470	7475	7475	7475	7475
		7475	7480	7480	7480	7485	7485	7485	7485	7495	7495	7495
		7500	7505	7510								
I5	3	3865	3875	3875	3900	3990	6230	6270	6400	7480	7495	
J	3	4555	4605	4640	4642	5075	5080	5110	5110	5870	5875	
		5880	5880	5890	6490	6505						
J1	3	5510	5515	5525	5535	6230	6270	6400	7330	7360		
K	3	3895	5555									
K1	3	3850	5565									
K2	3											
K3	3											
K4	3											
K5	3											
K6	3											
K7	3											
K8	3											
K9	3											
L0	4											
L1	4	5110	5165	6130	6120	7150						
L4	4											
L5	4											
L6	4											
L7	4	4485	4490	6175								
L8	4											
L9	4											
M	4	5570	5575	5580	5580							

C - MEAS (cont)

M1	4	4200	4210	4215	4220	4225	4230	4235	4240	4245	4250
	5435	5450	5460	5470	5480	5490	5500	5510	5520	5530	5540
	7100	7130	7185	7235							
M2	4	4200	4215	4220	4225	4230	4235	4240	4245	4250	4255
	7060	7060	7070	7105	7110	7135	7150	7250			
M3	4	4200	4220	4230	4235	4240	4245	4250	4255	4260	4265
	7085	7065	7065	7070	7110	7140	7195	7200	7205	7205	
N	4	3750	4910	4915	4920	4925	4930	4935	4940	4945	4950
	7590	7785									
N0	4	3825	3830	3845	3855	3860	3865	3870	3875	3880	3885
	5810	6090	6275	6375	6405	7060	7060	7070	7085	7742	7743
	7750	7750	7755								
N1	4	7470									
N2	4	3870	3930	3975	4405	4945	4950	4955	4960	5040	5185
	5265	5330	5480	5500	7235						
N3	4	3810	3820	4000	4500	4805	4835	4855	4885	4885	4100
	4905	5235	5225	5250	5255	5270	5275	5295	5430	5435	5460
	5460	5470	5470	6270	6275	6300	6540	6590	6800	6870	6870
	6900	6905	6920	6940	6945	6960	6975	6980	6980	7030	7035
	7055	7055	7055	7060	7060	7060	7065	7065	7065	7070	7070
	7070	7070	7090	7100	7105	7110	7130	7130	7135	7140	7185
	7190	7200	7205	7285	7290	7395	7490	7495			
N4	4	4100	4165	4335	4820	4833	4855	4875	5140	5275	5295
	5310	5320	5325	5400	5490	5490	5615	5870	5905	6730	6730
	6735	7030	7075	7075	7180						
N5	4										
N6	4	4940	5040	5170	5640	6405	6795	7145	7310	7400	7600
	7600										
N7	4	3750	4930	4935	4940	4945	5040	5170	5640	5775	6040
	6085	6250	6405	6795	7145	7310	7400	7590	7770	7770	7780
	7780	7785	7790								
N8	4	4935	4940	5035	5340	5345	5520	5565	5575	5585	5590
	5030	5640	5655	5665	5675	5685	6090	6305	6370	6375	6380
	6385	6390	6395	6400	6405	7230	7315	7365	7385	7290	7295
	7300	7305	7310	7335	7340	7395	7400	7400	7790		
N9	4	4300	4205	4205	4260	4265	4270	4280	4285	4290	4300
	4325	4905	5290	5375	5505	5530	5630	6220	6320	6340	6355
	6355										
P	5	3835	3990	3995	3995	4095	4210	4240	4245	4250	4540
	5195	5200	5245	5250	5305	5315	5375	5385	5415	5420	5525
	5705	5710	6295	6305	6390	6910	6915	6920	6975	6995	7010
P1	5	6645	6645	6830	6830	6840	7235				
Q	5	3780	3790	3800	3845	3990	4070	4070	4075	4075	4120
	4135	4140	4140	4140	4140	4140	4150	4165	4165	4170	4170
	4175	4190	4195	4315	4325	4330	4335	4340	4350	4360	4375
	4380	4390	4395	4435	4440	4450	4455	4460	4490	4500	4590
	4605	4610	4615	4615	4620	4642	4645	4645	4655	4660	4665
	4670	4675	4685	4690	4710	4745	4750	4760	4770	4785	4790
	4865	4885	4915	4925	5015	5060	5070	5100	5115	5140	5150
	5215	5255	5290	5350	5360	5440	5470	5470	5490	5530	5500

C - MEAS (cont)

		5615	5630	5630	5645	5655	5665	5670	5725	5755	5775	5790
		5795	5815	5825	5855	5905	5910	5930	5935	5950	5955	5965
		5970	6055	6065	6210	6240	6245	6255	6320	6330	6355	6465
		6470	6495	6505	6535	6550	6610	6630	6695	6700	6745	6765
		6775	6805	6820	6830	6850	6830	6840	6840	6840	6845	6860
		6925	6935	6940	7005	7070	7075	7270	7280	7300	7350	7365
		7385	7395	7400	7405	7425	7430	7435	7495	7500	7560	7565
		7570	7580	7602	7720	7743	7755					
00	5	5320	5385	5780	5790	5800	6475	6505	6825	6830	6830	
		6830	6840	6840	6840	6955	6960					
01	5	4550	4605	5070	5255	5285	5535	5955	5955	5975	6490	
		6505	6900	6965	6965	6975	7000	7005	7015	7020	7055	7070
02	5	4025	5600	5665	6405	6505	7060	7070	7475	7500	7500	
		7505										
03	5	6495	6500	6590	6905	6970	6970	6975	7385	7020		
04	5	5555	5560	5565								
05	5	6595	7110	7245	7260							
06	5	6595	7140	7245	7260							
07	5	7245	7260	7305	7330							
R1	5	3860	3865	3895	3895	3980	3980	3990	5385	5385		
R2	5	4320	4325									
R5	5	3745	4000	4830	4830	4835	4835	4840	4840	4875	5270	
		5285	6885	6895								
S	5	4985	5110	5110	7330	7520						
S3	5	4000	4000	5080	5085	5085	5090	5090	5110	5270	5275	
		5325										
T	5	3855	3860	3895	5000	6720						
T1	5	4150	4165	4170	4780							
T2	5	5230	5235	5240	5240							
T6	5	3835	4950	5130	5135	5140	5160	5165	5250	5310	5315	
		5325	5385									
T9	5											
U	5	3755	5205	5250	5315	5525	5705					
U1	5											
V	5	4060	4065	4555	4035							
V1	5	4200	4225	4225	4260	5115	5420	5420	5460	5800	7010	
		7010	7055									
V2	5	4200	4230	4230	4270	6000	7015	7015	7060			
V3	5	4200	4235	4235	4265	6000	7020	7020	7065			
V4	6	4200	4240	4240	4280	4285	4310	4315	4330	4335	5710	
V5	6	4200	4245	4245	4285	4310	4315	5320	5375	5590	5640	
		5710										



## C - MEAS (cont)

V6	6	4200	4200	4200	4200	4200	4200	4200				
V7	6	5540	5540	5540	5540	5540	5540	5540	5540	5540	5540	5540
V8	6	4060	4060	4060	4060	4060	4060	4060	4060	4060	4060	4060
V9	6	4065	4065	4065	4065	4065	4065	4065	4065	4065	4065	4065
W	6	6795	6795	6795	6795	6795	6795	6795	6795	6795	6795	6795
W1	6	4325	4325	4325	4325	4325	4325	4325	4325	4325	4325	4325
X	6	4215	4215	4215	4215	4215	4215	4215	4215	4215	4215	4215
X1	6	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830
X2	6	4210	4210	4210	4210	4210	4210	4210	4210	4210	4210	4210
X5	6	3730	3730	3730	3730	3730	3730	3730	3730	3730	3730	3730
X6	6	3730	3730	3730	3730	3730	3730	3730	3730	3730	3730	3730
Y	6	3855	3855	3855	3855	3855	3855	3855	3855	3855	3855	3855
Y1	6											
Y5	6											
Z	6	4330	4330	4330	4330	4330	4330	4330	4330	4330	4330	4330
Z1	6	8										
Z5	7	6595	6595	6595	6595	6595	6595	6595	6595	6595	6595	6595
FHA	7	4990	4990	4990	4990	4990	4990	4990	4990	4990	4990	4990
FHB	7	3780	3780	3780	3780	3780	3780	3780	3780	3780	3780	3780
FHC	7	5015	5015	5015	5015	5015	5015	5015	5015	5015	5015	5015
FHD	7	4665	4665	4665	4665	4665	4665	4665	4665	4665	4665	4665
FHE	7											
FHF	7	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790
FHG	7	4175	4175	4175	4175	4175	4175	4175	4175	4175	4175	4175
FHI	7	5015	5015	5015	5015	5015	5015	5015	5015	5015	5015	5015
FHJ	7	4665	4665	4665	4665	4665	4665	4665	4665	4665	4665	4665
FHK	7	3845	3845	3845	3845	3845	3845	3845	3845	3845	3845	3845
FHL	7											
FHM	7	4350	4350	4350	4350	4350	4350	4350	4350	4350	4350	4350

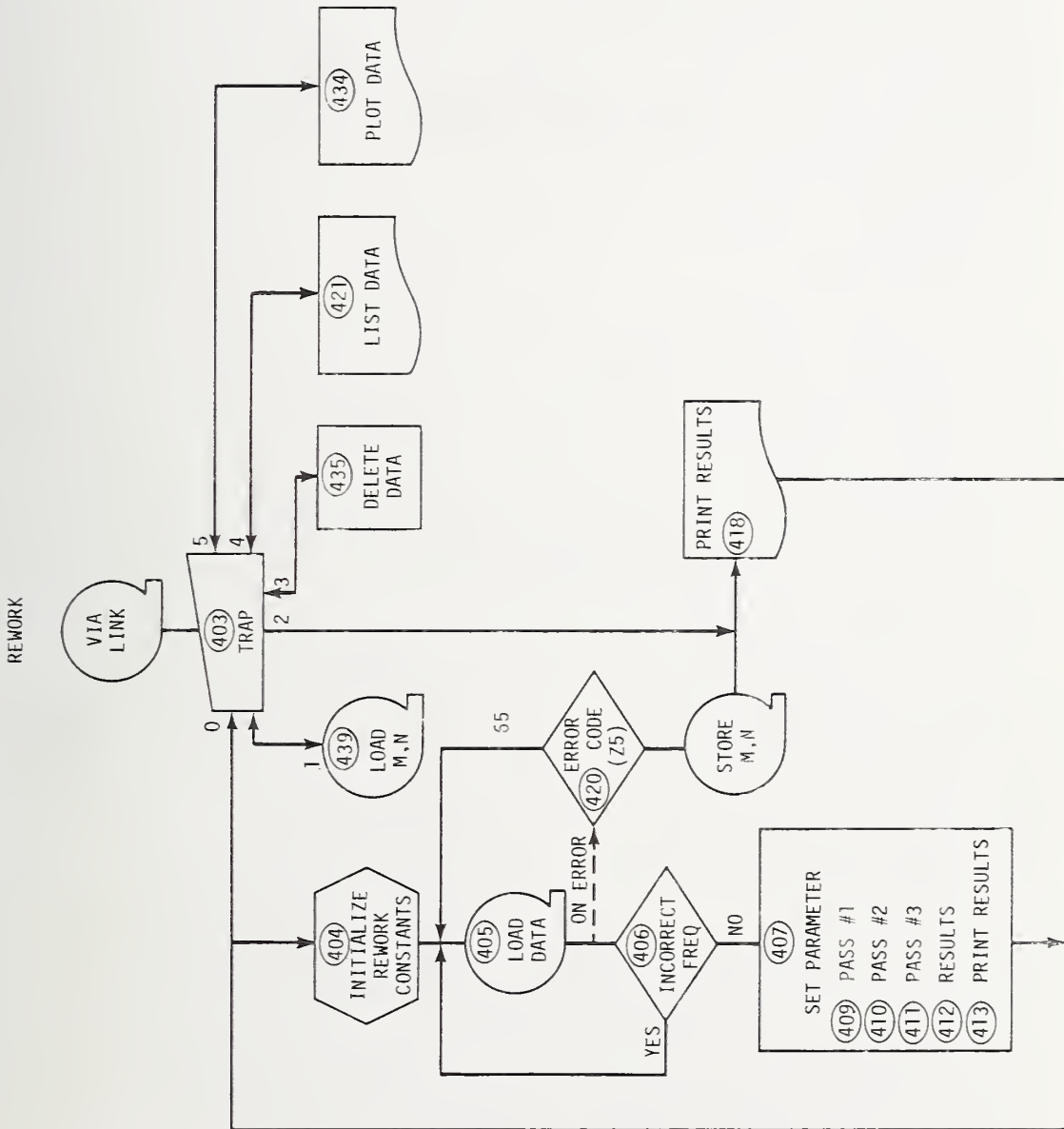
C - MEAS (cont)

FHH	7	4375	4390	4435	4450	4510	4555	4710	4745	4760	4800
	4823	4830	4915	4970	5020	6065	6105	6120	6130	6140	6150
	6165	6185	6195	6305	6635	6645	6655	6665	6715	6730	7425
	7525	7540	7560	7580	7600	7635	7645	7660	7720	7750	7780
FHP	7	4540	4590	5135	5245	6295	6890				
FHQ	7										
FHR	8	4135	4410	4415	4740	4980	5230	5235	6880		
FHS	8	3755	3780	4605	5060	5390	5490	5600	5645	5670	5725
	5815	5825	5910	6055	6240	6245	6255	6355	6610	6610	6765
	6765	6775	6805	6845	6860	7035	7075	7350	7365	7405	
FHT	8	4125	4985	5075	6080	6875	7680				
FHU	8	4520	4665	5190	6240	6765					
FHW	8	4865	4885	5060	6745						
FNX	8	4410	4410	4415	4785	6700	6700	6880	6880		
FNY	8	3810	5215	5255							
FNZ	8	3830	5550								
FOJ	9	3835	4375	4380	4390	4395	4480	4480	4480	4410	4415
	4420	4420	4420	4435	4440	4455	4455	4480	4480	4485	4485
	4490	4490	4490	4490	4550	4605	4620	4640	4640	4642	4645
	5170	5175	5200	5205	6385	6560	7145	7150	7155	7160	7165
	7735										
FOJ	9										
FOJ	9	3710	4275	4295							
FOJ	9	3835	5130	5135	5140	5160	5165	5250	5310	5315	5325
	5385	5515	5525	5700	5705	5875	6565	6900	6905	6920	6940
	6945	6960	7170	7175	7180	7185	7190	7205	7210	7215	7220
	7225	7740									
FOJ	9	3710	4295	4380	4380	4385	4310	4320	4320		
FOJ	9	3710	4260	4265	4265	4270	4275	6335			
FOJ	9	3715	4940	5335	5340	5345	5560	5565	5575	5585	5590
	5620	5640	5655	5665	5665	5665	5770	5770	5780	5790	5905
	5970	6040	6090	6365	6370	6375	6380	6385	6390	6395	6400
	6405	6465	6475	6480	6485	6490	6505	6505	6505	6505	6505
	7230	7235	7265	7285	7290	7295	7300	7305	7310	7335	7340
	7395	7400	7400	7610							
FOJ	9	5975	6020	6830	6830	6830	6840	6840	6840	7600	
FOJ	9	3895	5555	6010	7475	7480	7480	7505			
FOJ	9	6015	6500	7475	7475	7475	7475	7480	7485	7485	7485
	7485	7495	7495	7495	7500	7670	7742				
FOJ	9										
H#	3700										
FOJ	3710	4280	4295	4295	4300	4320	5390	5710	5710	5720	5720
	5720	5720	5730	6335							

# C - MEAS (cont)

G#	3885	5365	5565	5765	5965	5775	6250	6590	6595	6555	7670
	7685	7742	7745	7775							
H#	3955	3960	3970	4000	4025	4040	4055	4060	4065	4075	4080
	4105	4110	4115	4150	5762	5764	6090	6280			
B#	4010	4020	4075								
L	4995	4995	5000	5000	5125	5135	5485	6275	6310	6315	6665
	6665	6720	6795	7210	7605	7690					
I#	5762										
E#	5764										
L#	6705	6710	6770								

# 8.6 D - REWORK



# D - REWORK (cont)

```

50 L4="ABS(D.45 REWORK J1-F16 I1-F12"
52 MAT M=ZER(40,10)
55 B5=53
60 B6=30.9
61 F3=F7+H9=V8=0
62 F5=F9=1
63 NC(21+2)=0.136
64 F=7.5
65 Q=FHJ2
66 GOTO 1395
200 DEF FHO(L)=(NC(21+2)+HL(1+6) SINL)*60
275 DEF FHB(Q)
280 FOR I=1 TO Q
285 BEEP
290 WAIT ABS(100+(I-4))
295 NEXT I
300 RETURN 0
305 DEF FHH(Q)
310 DISP "( =HC):";0;
315 INPUT B#
320 IF B#="" THEN 330
325 RETURN VAL(B#)
330 RETURN 0
335 DEF FHI(Q)
340 A#=" - - - - - ==###@#@#@#"
345 A#=A#[4*Q-3,4*Q]
350 A[5]=A#
355 A[9]=A#
360 FORMAT F5.1
365 WRITE (15+360)A#;A4;H4;H4;H4;A#
370 RETURN 0
375 DEF FHE(N0)
385 L7=256*EXP(0.111*(AC(4+10)*10.75+Q)*(AC(3+10-3)*9+2)*3.16)
390 Q=(0.9211/(1+0.2912/F12)+5.101*(1+596/F12)/(1+3596/F12)*12)
395 Q2=293/(AC(3+10-32)*5*9+273.15)
400 G4=6.644E-03*(1-0.02252*Q0)+110.52*Q2+2.75*Q
405 Q=1-0.02215*(11.02-Q0)+Q2
410 L4=5.145*Q2*(1-Q)+8.775+3.173*Q+7.775
415 Q=(1+493.3*F12)/(1+493.3*F12+13*L7*(1+0.0046*L7)
420 G5=1.451E+05*(1-0.02252*Q0)+15.262*EXP(-644*Q2/293)/(1+Q2+293)+3*Q
425 L5=2.094*Q.37*(1-Q2)*2)
430 G6=2.529E-02*(1-0.02252*Q0)+15.262*F12/(1/Q2+293)+1.5*L7*(1+0.0046*L7)
435 L6=2.17
440 Z1=G4+L4+G5+L5+G6+L6
445 L8=Q2*(0.9227*(1-0.02252*Q0)+15.262+0.0202*L7)
450 L9=0.013
455 K1=10*(1-Z1/10/SINL)
460 B4=293*Q2*(1-F12)/1.0716
465 IF B<14 THEN 480
470 B0=B
475 GOTO 485
480 B0=-4.248+3.1468*B+0.10259*B1+0.0030247*B13
485 Q2=(TC(N0+9)+100)/(1.3913*800)*12
490 K2=(1-EXP(-Q2))/Q2/1.001
495 K3=1
500 Q=(W/F+2E+03)*12
505 K4=K5=K6=K7=1
525 J1=10*(1-0.00011*F+F/SINL)
530 K8=1-(1-J1)*EXP(-0.467*Q2)
535 Q=14/(2.969E-04)*(L8-2*L9*(TANL+Q/SINL)*12)
540 S=1/0
545 K9=1-(1-S)*EXP(-0.467*Q2)
550 K=F13*K2+F3+K4+K5+K6+K7+K8+K9
555 RETURN K

```

## D - REWORK (cont)

# D - REWORK (cont)

```

865 DEF FNM(Q)
870 Q=FN30
875 FORMAT 5X,"TEMP          DEW PT          REL HUMID          WATER DENS          "
880 WRITE (15,875)"CLOUD COVER          WIND"
885 FORMAT F9.1," F",F10.1," F",F11.1," %",F10.1," mm/ht3",F10.0,F10.0," mph"
890 AC5]=1000*EXP(0.111*(AC4]/10+10.78-(AC3]/10)+0.78))
895 Q=100*(AC6]-INT(AC6)]
900 WRITE (15,885)AC3]/10,AC4]/10,AC5]/10,L7,INT(AC6]/100),Q
905 RETURN Q
910 DEF FNM(Q)
915 GOTO Q OF 930
920 PRINT TAB31,"FIT TO ";HC1,93;"DATA"
925 RETURN Q
930 PRINT "TAPE";V8"Data";F9;L4;
935 FORMAT 5X,"REWORK",F6.2
940 WRITE (15,935)NC1,10]
945 PRINT TAB15,D4;E4
950 RETURN Q
955 DEF FNY(N3)
965 IF N3 THEN 1155
975 IF F2 THEN 1085
980 X1=FNZ(N0)
985 Y=1+X1*G/T
990 R1=T/H9
995 IS=(Y-1)*R1/250
1000 IF N2=-3 THEN 1055
1005 IS=(Y-1)*R1/50
1010 GOTO 1060
1020 R=401
1026 FORMAT "      K1      K2      K3      K6      K8      K9      K      RPR-eff "
1030 WRITE (15,1026)"R-eff  S(FU)      Xi(K)"
1035 FORMAT F7.3,F6.3,F8.4,F7.2,F8.1,E11.3
1040 WRITE (15,1035)K1,K2,K3,K6,K8,K9,F,B2,B3,SCN0,4],FNZ(N6)
1045 PRINT
1050 RETURN Q
1055 Q=FNFB
1060 FORMAT " ZERO LEVEL",4X,"100% LEVEL",4X,"Y(DB)",5X
1065 WRITE (15,1060)" R-FACTOR      I("];L1,30;)"      S(Jn)      TA"
1070 FORMAT F7.4,"*TA",F11.4,"*TA",F11.4,F11.3,F11.2,F9.1,F9.1
1075 WRITE (15,1070)R1,Y*R1,10+LGTY,0,X1*G,SCN0,4],H9
1080 PRINT
1085 PRINT
1090 FOR I=0 TO 5
1095 PRINT TAB(10*I+6),
1100 IF N2=-3 THEN 1115
1105 PRINT 20*I;
1110 GOTO 1120
1115 PRINT 4*I-10;
1120 NEXT I
1125 PRINT "(%) "
1130 Q=FNFB
1135 PRINT " N3      ";A4;TAB30,"PWR. PWR(GDD)"

```



# D - REWORK (cont)

```

1140 IF N2>-3 THEN 1150
1145 R1=R1-25*I5
1150 GOTO 1245
1155 IF F2=0 THEN 1165
1160 P=P-(X+F[2]*X1+F[1]*X2)
1165 Q=INT((P-R1)/I5+0.5)+8
1170 P=INT(10*I5*P+0.5)/10*I5
1180 A#[1,72]=" "
1185 A#[33,33]="!"
1190 FORMAT F3.0
1195 OUTPUT (A#[1,4],1190)N3,
1200 FORMAT F9.5
1205 OUTPUT (A#[60,69],1200)P,
1210 IF Q<1 OR Q>72 THEN 1220
1215 A#[Q,Q]="*"
1220 WRITE (15,1190)A#
1230 IF N3<N4 THEN 1245
1232 Q=FNF8
1235 PRINT TAB7;A#
1240 PRINT
1245 RETURN 0
1250 DEF FNG(Q)
1255 REM <G/T #2 P135>
1260 IF Q=-9 THEN 1330
1265 IF Q>0 THEN 1275
1270 M1=M2=M3=N9=V1=V2=V3=V4=V5=V6=0
1275 N9=N9+1
1280 M1=M1+X2
1285 M2=M2+X1
1290 M3=M3+P
1295 V1=V1+X2*I2
1300 V2=V2+X1*I2
1305 V3=V3+X1*X2
1310 V4=V4+P*X2
1315 V5=V5+P*X1
1320 V6=V6+P*I2
1325 GOTO 1368
1330 Y[1]=V4-M1*M3/N9
1335 Y[2]=V5-M2*M3/N9
1340 G[1,1]=V1-M1*I2/N9
1345 G[1,2]=G[2,1]=V3-M1*M2/N9
1350 G[2,2]=V2-M2*I2/N9
1355 MAT C=INV(G)
1360 MAT F=C*Y
1365 R2=V6-M3*I2/N9-F[1]*Y[1]-F[2]*Y[2]
1366 X=(M3-F[1]*M1-F[2]*M2)/N9
1368 RETURN 0
1370 DEF FNF(Q)
1374 GOTO 0 OF 4985,4815,1020,5320,5574,5624,5008,5690,5600,5633
1376 GOTO 1395
1378 DEF FND(Q)
1380 Q=FNDQ
1382 RETURN 0
1383 DEF FNV(Q0)
1384 GOTO 00 OF 4570,2140,4430,4480,4548,5800,5130,5230,5642,5660,5020,3925,5648
1385 GOTO 1395

```

# D - REWORK (cont)

```

1387 DEF FNJ(O)
1390 GOTO 0 OF 3165,4105,5075,6225,7300,8255,9015
1395 R=402
1400 F6=0
1405 REDIM CC(2,2),GC(2,3),FC(2),MC(40,10),NC(2)
1410 DISP "0 RN,1LOAD,2AUTO,3DEL,4G-T,5PLT,ERR":
1415 Q=FNBS+FNNO
1420 GOTO 0 OF 5017,3118,4863,3225,4847
1425 R=403
1440 Q=FNH1
1442 DISP "GRAPH DATA=NO?":
1444 F1=FNNO
1455 RESTORE
1460 DISP "START @ RETURN?":
1465 NC1,100=FNBS+FNHHC1,100-0.1
1470 Q=FNH6
1600 R=404
1639 IF F8=0 THEN 1645
1640 Q=FNH11+FNH9
1642 MAT M=ZER
1643 HC1,100=A0
1645 R=405
1650 SERP0R Z5,3195
1655 F2=H=L1=N4=T6=0
1660 E5=6/3600
1665 F4=F4+1
1670 N8=MC40,10+1
1675 Q=F4+8+F7+33
1680 LOAD DATA #C10-5+170,0
1685 PRINT "FILE":0,1,3,"RUN/SET":AL10/100
1690 PRINT "ABS,S#,H#,"FREQ":HC20/1000
1695 Q=FN52
1700 IF N9>5 OR DC1,20=0 THEN 1645
1705 Q3=AC20/1000
1710 Q=F3-Q3
1715 R=406
1720 IF F3 AND Q THEN 1645
1725 IF F=Q3 THEN 1740
1730 F=Q3
1735 Q=FNJ2
1740 N7=(AC10/100-INT(AC10/100))/100
1741 N6=INT(AC10/100)
1742 E8=24/360/COS(DNO,3)
1743 N=8*(N7-1)
1745 IF F8=0 THEN 1755
1746 Q=FNH4+FNH5+FNH4+FNH20
1747 HC40,10=HC40,10+1
1748 GOTO 1645
1750 R=407
1755 N3=N9=0
1760 H=H+1
1765 SERP0R Z5,3195
1770 N7=INT((H-1)/6)+1
1775 N2=H+2-6*N7
1780 T6=N3+4
1785 N4=DC(T6,3)
1790 IF T6=1 THEN 1800
1795 N4=DC(2,3)
1800 V7=DC(T6,7)/100
1805 E1=DC(T6,4)/1000
1810 E1=DC(T6,5)/1000
1825 A=DC(T6,10)/100+100
1830 L=DC(T6,20)/100
1835 IF F1=0 AND N2# 1 THEN 1655

```

# D - REWORK (cont)

```

1840 R=400
1845 Q=FNN1+FNC1+FNKHQ+FNN1+FNH3
1850 PRINT
1855 FORMAT " MEAS      AZIMUTH      DWN      TIME-H:31      OFFSET      ELEV
1860 WRITE (15,1855)"OUT      RUN      SLF      H"
1865 FORMAT F2.0,"sec",F11.2,F10.4,F11.1,F9.3," deg",F9.2,F6.6,3F5.0
1870 B=FNOL
1875 V9=FNZ(N9)*G/H9
1880 WRITE (15,1865)C0M+E5,A,B/50,F1,B1,L,N2,N6,N7,H
1885 TRANSFER TCHQ,13 TO S4
1890 V1=M1=0
1895 PRINT
1900 IF N2>-2 AND F1=0 THEN 1910
1905 FORMAT "BT=","F6.3,17X,"T TR = ,F6.4," +",F8.5,"*OSC L",18X,F5.1
1910 WRITE (15,1905)V9,N116,23,N116,63,S4
1915 PRINT
1920 R=400
1925 P=U=AC93/10+4
1930 T=(NC18,23+NC18,63/SINL)*H9
1935 IF N2#0 THEN 1945
1940 Z=T/H9
1945 IF N2=-3 THEN 2446
1950 V=LOG(0.5)*4/(E/30+E3/E5/N4)*TC
1955 Q1=F1
1960 W1=F1=0
1965 F1=FNW2+Q1
1990 S3=X
1995 W1=FC13
2000 FORMAT "PASS #FIT DET(C)      *HPEW      T/T0      DT("
2005 WRITE (15,2000)S4,"")/TA      PERI#      SLOPE T-FIT"
2010 FORMAT F2.0,F6.0,F9.3,8X,"- ",F13.4,F9.4," +",F6.2,"%",F7.2,F7.2,"N",2F6.1
2015 Q=100*SQR(R2/N9)/FC23
2020 A=100*(S3-NC18,23-NC18,63/SINL)*V9
2025 WRITE (15,2010)1,N9,DET(C),S3,FC23,Q,W7,W1*200/S3,A,"%"
2030 R=410
2035 NC18,23=S3-NC18,63/SINL
2040 T=(NC18,23+NC18,63/SINL)*H9
2045 N9=0
2050 Q=B/120*E8/E5+1
2055 FOR N3=V7-Q TO V7+Q
2060 IF N3<1 THEN 2090
2065 P=U*EXP(DLT6,N3+73/10+4)
2070 X1=2*(N3-V7)/N4
2075 X2=X1*X1
2080 P=LOG(P-S3-W1*X1)
2085 Q=FNQH9
2090 NEXT N3
2095 P=FNQ(-9)
2100 V=FC13
2105 W1=-FC23/FC13/2
2110 E6=V7+W1/H4/2
2115 FORMAT F2.0,F6.0,F9.3,8X,"- ",F11.4,F6.2,"%",F7.2,5X,"- ",6X,"-
2120 E7=E5/E8+N4*SQR(1000.5/V)
2125 Q=EXP(X-FC13)*N1+2)
2130 WRITE (15,2115)2,N9,DET(C),F1,Q," +",100*SQR(R2/N9)/Q,E6
2135 DLT6,73=100*E6
2136 GOTO 2208

```

# D - REWORK (cont)

```

2140 R=411
2145 H9=0
2150 IF F1=0 THEN 2160
2155 Q=FHY0
2160 FOR H3=1 TO H4
2165 P=U*EXP(DCT6*(H3+7)/1014)
2170 IF F1=0 THEN 2180
2175 Q=FHYH3
2180 X2=2*(H3-V7)/H4
2185 X1=EXP(V+(X2-M1)*t2)
2190 Q=FNGH9
2195 NEXT H3
2205 P=FNG(-P)
2206 RETURN 0
2208 R=412
2209 Q=FHW2
2210 IF FL21<1.8E+03 AND FL21<5.3E+04 THEN 2230
2215 PRINT "UNDERFLOW"
2220 DCT6*6J=-32700
2225 GOTO 2235
2230 DCT6*6J=LGT(FL21)+1014
2235 IF H2#0 THEN 2260
2240 Z=X
2245 AC8J=Z*1E+04
2255 AC10J=E7*1E+04
2258 R=413
2260 IF F1=0 THEN 2280
2265 PRINT
2270 WRITE (15,2000)C8J,"D 10      FHW2      SLOPE  T-FIT"
2275 FORMAT F2.0,F6.0,F9.1,F9.3,"D=0",F10.4,F9.4,"  +- ",F6.2,"%",2F7.2,"N",2F6.1
2280 Q=100*SOP(P2,H3)/FL21
2285 A=100*(X-HC18+2J-HC19)/CJ1*SINH(X/V9
2290 WRITE (15,2275)3,H9,DCT6J,E7,X,FL21,Q,E6,FL1J*200/X,A,"%"
2295 Q=2
2300 IF H2#2 THEN 2310
2305 Q=5
2310 Q=FNI(Q)
2435 GOTO 2540
2440 R=414
2445 M1=V1=0
2450 IF F1=0 THEN 2460
2455 Q=FHY0
2460 FOR H3=1 TO H4
2465 P=U*EXP(DCT6*(H3+7)/1014)
2470 IF F1=0 THEN 2480
2475 Q=FHYH3
2480 M1=M1+P
2485 V1=V1+P*P
2490 NEXT H3
2492 H3=H3-1
2495 Z=M1/H3
2500 FORMAT 11X,"T>TH",10X,"SIGMA",9X,"MEAN",8X,"#PTS",9X,"T"
2505 WRITE (15,2500)
2510 FORMAT F16.4,F14.2,"  N",F11.2,"  I",F9.0,F13.1
2515 Q=100*SOP((V1-M112/H3)/(H3-1))/2
2520 WRITE (15,2510)2,Q,Q/SOP(H3-1),H3,Z*H9
2525 PRINT
2530 HC18+2J=Z-HC18+6J*SINH
2535 Q=FNI3
2540 IF H2<2 THEN 1750

```

# D - REWORK (cont)

```

2550 V5=M2
2560 J=V2
2565 Q=FNF4+FNF5+FNF9+FN320
2562 M2=V5
2564 V2=J
2575 STORE DATA #0(10-S*F7),Q4,7,F7,1
2580 MC40,11=MC40,11+1
2585 GOTO 1645
2590 R=415
2595 Q=M2+1
3000 MC0,31=MC0,31=MC0,41=MC0,51=MC0,61=0
3005 Q=FN15
3010 Q=FN35
3015 GOTO 1655
3018 R=416
3020 DISP "STORE MAT N=MC0=MC0,11"
3021 Q=FN32+FNH1
3022 IF Q=0 THEN 3024
3023 Q=FNW12+FN310
3024 RETURN 0
3025 R=417
3026 MC6,111=F
3028 MC8,31=H9
3030 TRANSFER P# TO TC9,11
3035 FOR I=1 TO 10
3040 MC9,I1=TC9,I1
3045 MC10,I1=TC9,I+101
3050 NEXT I
3055 Q=10-S*F7
3060 Q1=4+F9-3+17*F7
3065 STORE DATA #0,Q1,M
3070 STORE DATA #0,Q1+2,N
3075 FORMAT " FREQ",10X,"IN FILE",7X,"IN FILE",8X,"TAPE",7X,"SUMMARY SET",4X
3080 WRITE (15,3075)"REWORK"
3085 FORMAT F9.3,4F13.0,F15.2
3090 WRITE (15,3085)F,Q1,Q1+2,V8,F9,MC1,101
3095 Q=FN330
3100 RETURN 0
3110 R=418
3120 Q=FNJ3
3125 F5=0
3128 DISP "REWORK #1"
3130 MC1,101=FNHMC1,101
3135 F6=M0=1
3136 IF F#0 THEN 3140
3138 F=7.5
3139 Q=FNJ2
3140 Q=FNJ4+FNJ5+FNJ7+FNJ8+FNJ11+FNJ2+FNJ3+FNJ4+FNJ6+FNJ7.1*FNJ8.2+FNJ1.3+FNJ2.2
3142 IF F5 THEN 3148
3144 Q=FNJ7
3146 GOTO 1395
3148 Q=FNW12+FNW10+FNW6
3150 GOTO 1600
3165 R=419
3170 DISP "RESTART @ N="
3175 INPUT Q
3180 F2=0
3185 M=Q-1
3190 GOTO 1750

```

# D - REWORK (cont)

```

3195 R=420
3200 WAIT 1000
3205 Q=FNS6
3210 IF C5=56 THEN 1645
3215 IF C5#61 THEN 1645
3216 Q=FNV12
3217 IF F6=0 THEN 1395
3218 IF F5=0 THEN 3135
3219 ERROR C5,3221
3220 GOTO 3135
3221 Q=FNV6
3222 GOTO 1600
3225 R=421
3226 D#=""
3228 IF F6 THEN 3240
3240 Q=FNS6+FNH1+FNH1+FNH4
3244 RETURN 0
3255 R=422
3285 FORMAT /, 'PUN/SET STAB      ELEV      G/T      G/TH      HPBW#1 HPBW#2
3290 WRITE (15,3285) " FREQ      Y-fac      REF      HUF"
3295 FORMAT F6.2,F7.1,2F8.3,6F7.3
3300 I=0
3305 I=I+1
3310 Q=MDI,11
3315 IF Q-INTQ=0 THEN 3375
3325 Q0=MDI,61
3330 Q1=MDI,71
3335 Q2=MDI,81
3340 J=MDI,91
3345 E=ABSQ
3350 TRANSFER TO 100*(E-10+INT(10*(E-10))) TO S#
3355 WRITE (15,3295)MDI,101,"      ",54,Q,MDI,21,MDI,31,MDI,41,MDI,51,Q0,Q1,Q2,J
3360 IF INT(1/3)-1/3 THEN 3370
3365 PRINT
3370 GOTO 3305
3375 Q=FNS30
3376 RETURN 0
3380 R=423
3382 N0=0=1
3384 AC31=10*B5
3386 AC41=10*B6
3405 REDIM M(MC40,11),101
3410 SORT M,C,0
3415 Q=FNS3+FNH1+FNH1+FNH4
3420 REDIM MC40,101
3425 IF MC40,11#3 THEN 3505
3430 FOR J=19 TO 26
3435 IF J=23 THEN 3550
3440 I=N0=0
3445 I=I+1
3450 IF MDI,11=0 THEN 3445
3455 MCJ,91=MCJ,101=MDI,J-171
3460 FOR I=1 TO MC40,J1
3465 X1=MDI,11
3470 IF X1 <= 0 THEN 3510
3475 X2=1/SINH1
3480 P=MDI,J-171
3485 Q=FNH9
3490 IF P#MCJ,91 THEN 3500
3495 MCJ,91=P
3500 IF P#MCJ,101 THEN 3510
3505 MCJ,101=P
3510 NEXT I

```

# D - REWORK (cont)

```

3515 Q=FNH4
3520 IF J>19 THEN 3540
3525 PRINT TAB(5, # FT: = (J))
3530 NCJ,9J=H9
3535 PRINT
3540 Q=FNH5
3545 Q=FNH3
3550 NEXT J
3555 Q=FNH10
3560 RETURN Q
3565 DEF FNL(QQ)
3570 R=424
3575 D#=""
3580 J=INTQQ
3585 L0=10+(QQ-J)
3590 J=J-18
3595 IF NCJ,9J#0 THEN 3610
3600 PRINT "DATA NOT FIT LET:R0,FWB0
3605 RETURN Q
3610 IF L0 THEN 4190
3615 F2=FNH3
3620 IF F6 THEN 3660
3625 DISP "FIT:Q=080, 1=LIN"
3630 F2=FNH2+FNH0
3635 IF NCJ,9J=0 THEN 3590
3640 DISP "ZERO(MIN=1+NCJ,9J) (MAX=1+NCJ,10) "
3645 INPUT R1
3650 DISP "FULL SCALE (MAX=1+NCJ,10) "
3655 INPUT Q
3660 IS=Q-R1
3665 IF F1 <= NCJ,9J AND F1+15 >= NCJ,10J THEN 3690
3670 BEEP
3675 DISP "RANGE TOO SHORT"
3680 WAIT 1000
3685 GOTO 3640
3690 IS=IS/50
3695 L=30
3695 Q=FNH3+FNH1+FNH4+FNH1+FNH1+FNH15
3700 PRINT ". = FIT",
3705 D#="#000++MX"
3710 FOR I=1 TO N1-2
3715 TRANSFER TOI,17 TO 17
3720 PRINT D#(I,12) " = 100%",
3725 NEXT I
3730 Q=FNH3+FNH0+FNH2
3735 FORMAT "UNIT="*,2,14,10
3740 PRINT
3745 FIXED 3
3750 FOR I=0 TO 5
3755 PRINT TAB(10*I+6),F1, "W=1-10"
3760 NEXT I
3765 STANDARD
3770 WRITE (15,3735)15
3775 Q=FNH8
3780 PRINT "ELEV 100"
3785 FORMAT 40,"VALUE " "UNIT"
3800 WRITE (15,3735)
3805 FORMAT 15,1
3810 I=N2=0

```



# D - REWORK (cont)

```

3815 R=425
3820 I=I+1
3825 IF I>MC40,1 THEN 4170
3830 L1=MC I,1
3835 T2=MC I,10
3840 IF L1<0 THEN 3830
3845 N3=N3+1
3850 IF N3/30=INT(N3/30) THEN 3860
3852 Q=FNF8
3855 PRINT TAB10,A#
3860 IF N3>1 THEN 3895
3865 L=INT(L1)
3870 IF INT(L/5)-L/5=0 THEN 3885
3875 L=L+1
3880 GOTO 3870
3885 J1=MC I,J-17
3890 IF L1 >= L THEN 3990
3895 Q=INT((J1-R1)/15+0.5)+1
3900 X=10*(10+L1-INT(10+L1))
3905 B#D#(X,X)
3915 W1=MC J,2-F2)+MC J,6-F2)*((F2=0)/SINH1+(F2=1)*L1)
3930 X=INT((W1-R1)/15+0.5)+1
3935 WRITE (15,3935)L1;
3940 A#=""
3945 A#[1,52]=" "
3947 IF X>52 THEN 3955
3950 A#[X,X]="."
3955 A#[Q,Q]=B#
3975 FORMAT F9.4,F8.2
3980 WRITE (15,3975) " ",A#,J1,T2
3985 GOTO 3820
3990 E=MC J,4-F2)
3995 T1=MC J,2-F2)+MC J,6-F2)*((F2=0)/SINH1+(F2=1)*L)
4000 IF J=21 OR J=22 OR J=24 THEN 4010
4005 E=FNV1+(C2=1)*10*LGT(1+E/100)+(C2#1)*E*T1/100
4010 Q=INT(E/15+0.5)
4015 IF Q>1 THEN 4045
4020 Q=1
4045 X=INT((T1-R1)/15+0.5)+2
4050 PRINT L;
4060 FORMAT " ",51"-"
4065 OUTPUT (A#,4060)"",
4070 IF X-Q<1 THEN 4085
4075 A#[1,X-Q]=" "
4080 A#[X-Q,X-Q]="!"
4085 A#[X,X]="."
4090 IF X+Q>51 THEN 4150
4095 A#[X+Q,52]=" "
4100 A#[X+Q,X+Q]="!"
4150 FORMAT F10.4," +-",F7.4
4152 A#=A#[1,52]
4155 WRITE (15,4150) " ",A#,T1,L
4160 L=L+5
4165 GOTO 3885
4170 Q=FNF8
4172 PRINT TAB10,A#
4175 D#=""
4180 Q=FNS36
4185 RETURN 0

```

# D - REWORK (cont)

```

4190 R=426
4195 REDIM Y(3)
4200 Y(1)=10
4205 Y(2)=50
4210 Y(3)=10
4215 IF F6 THEN 4260
4220 A$="G/T:"
4225 IF J=19 THEN 4235
4230 A$="G/To:"
4235 DISP A$;"Q=CSC (17,1)=LINEAR";
4240 F2=FNB2+FNB0
4245 REDIM Y(3)
4250 DISP "ELEV(DEG):START,STOP,STEP:"
4255 INPUT Y(1),Y(2),Y(3)
4260 R=427
4265 Q=FNS1+FNN1+FNC0+FNR1+FNN1+FNI3+FNS1+FNN0+FNF2+FNS1
4270 PRINT TAB24;"+" = LINEAR CONTRIBUTION"
4275 Q=FNS2
4280 FOR L=Y(1) TO Y(2) STEP Y(3)
4285 TRANSFER TO INT((J+2)/2),1+20*(J/2-INT(J/2)) TO B$
4290 B$(10)="="
4300 FORMAT F5.1,"deg:",13X,F7.3," +",F5.2," dB      (",F6.1," %)",4X,F6.3," GHZ"
4315 N0=1+FNV1
4335 WRITE (15,4300)L,B$,T1,10*LGT(1+E/100),E,F
4340 Q=FNS1
4345 FORMAT " E-S   E-F   E-Y   E-K1  E-K2  E-K3  E-K4  E-K5  E-K6  "
4350 WRITE (15,4345)"E-K7 +E-K8 +E-K9  E-TA"
4355 FORMAT F5.2,"%",12F6.2,"%"
4356 Q=C2
4357 Q0=Q+E9
4358 Q1=Q+B1
4360 WRITE (15,4355)Q+S,Q+E0,Q*Y1,Q*E1,Q*E2,Q*E3,Q*E4,Q*E5,Q*E6,Q*E7,Q*E8,Q0,Q1
4365 R=428
4370 IF L0#2 THEN 4405
4380 Q=FNS1+FNI4+FNF6+FNFI0+FNFI5+FNFI9++FNI4
4405 Q=FNS3
4410 NEXT L
4415 Q=FNS10
4420 REDIM Y(2)
4425 RETURN 0
4430 R=429
4435 Q1=(J=19)+(J=20)+(J=25)+(J=26)+10*(J=24)+100*((J=21)+(J=22))
4440 R1=INT(Q1*NDJ,9)/Q1
4445 Q=INT(Q1*NDJ,10)/Q1
4450 IF (Q-R1)>1 OR J>20 THEN 4475
4455 IF (NDJ,9)-R1)>(Q-NDJ,10) THEN 4470
4460 R1=R1-1
4465 GOTO 4475
4470 Q=Q+1
4475 RETURN 0
4480 R=430
4485 Q=ENG(-9)
4490 R2=V6-M3+2/N9
4495 NDJ,5]=Y(2)/GC(2,2)
4500 NDJ,1]=((M3-NDJ,5]*M2)/N9
4505 S=SQR((R2-NDJ,5]+Y(2))/(N9-2))
4510 NDJ,3]=S
4515 NDJ,7]=S/SORGC(2,2)
4520 NDJ,6]=Y(1)/GC(1,1)
4525 NDJ,2]=((M3-NDJ,6]*N1)/N9
4530 S3=SQR((R2-NDJ,6]*Y(1)/(N9-2))
4535 NDJ,4]=S3
4540 NDJ,8]=S3/SORGC(1,1)
4545 RETURN 0

```

# D - REWORK (cont)

```

4548 R=431
4550 FOR F2=0 TO 1
4555 Q=FNF2
4560 NEXT F2
4565 RETURN Q
4570 R=432
4575 H1=HC(J,4-F2)+3.3*Q84(1,20)
4576 IF J=19 OR J=20 THEN GOTO 4580
4578 H1=10*LG(1+HC(J,4-F2)*HL(4,2)*F2)+SORHC(1,9)
4580 Q=(F2+0)/SINH((F2-1)/L)
4585 M=HC(19,2-F2)+HC(19,8-F2)+Q
4590 T1=HC(J,2-F2)+HC(J,6-F2)+Q
4602 C2=1+((J-25)*FJ+25)*.01*(1+.6)*.69*1.4*(T1)-1
4610 M=10*(M/10)
4615 G=10*(HC(20,2-F2)+HC(20,6-F2)+Q+.19)*FHV9
4617 T=G*M
4620 Q=FNV13+FNE1
4635 Y1=C8*Y5
4640 S=TCN0,10)/10
4645 B1=D3
4650 E=C2*SOR(S+2+Y1+2+E0+2+E1+2+E2+2+E3+2+E4+2+E5+2+E6+2+E7+2+B1+2)+E8+E9
4655 RETURN Q
4815 R=433
4820 A$=""
4825 B$=""
4830 FORMAT 6X,F8.4," "+",F7.4," "+",F9.5," "+",2F8.5
4835 TRANSFER TO INT((J-20)/4+20+(F2-INT(J/2))/1) TO A$(1,15)
4840 TRANSFER TO 14,16-F2+5) TO B$(1,6)
4845 WRITE (15,4830)A$,HC(J,2-F2),HC(J,4-F2),HC(J,6-F2),HC(J,8-F2),B$
4846 RETURN Q
4847 R=434
4848 PRINT "PLT: 1G/T, 2G/T0, 3HFBW#1, 4HFBW#2, 6Y-FAC, 7NEF, 8NUF"
4849 PRINT "X.1=ERR TABLE, X.2=+VALUE LIST"
4850 Q=FNB2+FNS1+FNN1
4851 Q=FNL0
4852 GOTO 1395
4863 R=435
4864 DISP "DEL:RUN/SET(Q=EXIT)":
4865 Q=FNB2
4870 INPUT Q
4875 IF Q=0 THEN 1395
4880 SEARCH M,C,10,Q,01
4885 MC(01,1)=MC(01,1)
4890 GOTO 4864
4895 R=436
4900 C1=2.997925E+08/2*(8*PI*(1.37054E-2)*(F+10+9)+2)
4905 D0=0.9/F12
4910 G=B2*(D+F*0.313)/2
4915 B9+2+C1*1.39854E-4)/G
4920 B=3835/D/F+SOR(D3-D2)
4925 FOR I=1 TO H1
4930 Q=C-TC(I,15)/10
4935 Q3=TC(1,6)/10+Q3*(H1+4)/H1+12.97
4940 Q2=EXP(-TC(1,16)/10+Q4+Q3)*SEI(1,13)-1-TC(1,18)+100+103
4945 I5=SEI(1,11)+TC(1,8).1000/SOI(1,1)
4950 R=Q3+((F/TC(1,13)+100)-1)*(TC(1,16)+100-1)*(TC(1,2)-1000+(TC(1,11)+10+65)
4955 H3=F*((R/0)-.0840)+.04*100
4960 Q=EXP(-TC(1,16)/10+Q4+Q3+I5+H3*(TC(1,18)+100)+H
4965 TC(1,18)=C-Q2)/Q2*1000
4970 SEI(4,3)=Q2
4975 NEXT I
4980 RETURN Q

```

# D - REWORK (cont)

```

4995 R=437
4996 F7=0
5000A DISP 'TIME WY'
5005 M3=FN41
5006 RETURN 0
5008 R=438
5010 DISP 'DATA DEV: 1.43E+2500'
5015 F9=FN41
5016 RETURN 0
5017 R=439
5018 Q=F1*F1+FN77+FNUL
5019 GOTO 1385
5020 R=440
5022 Q=+10-S-FT
5025 Q1=4+79-+13+FT
5030 LOAD DATA #0-Q1
5035 LOAD DATA #0-Q1-L
5040 F=NC6*111
5041 IF F#0 THEN 5043
5042 F=7.3
5043 Q=FNJ2
5045 FOR I=1 TO 10
5050 TC9,I1=NC9,I1
5055 TC9,I+101=NC10,I1
5060 NEXT I
5065 TRANSFER TC9,I1 TO P8
5070 RETURN 0
5075 R=441
5080 DISP 'TEMP/FIT'
5085 B3=FN62+FN41 AL30*10
5090 AC31=10+B3
5095 DISP 'DEVI PT F 1'
5100 B6=FN41 AC41*10
5105 AC41=B6*10
5110 RETURN 0
5120 R=442
5125 L=DC4*21.102
5140 F2=N3=2
5155 N9=0
5160 B=FN6L
5165 FOR J1=2 TO 6
5170 X1=DCJ1*51/16.667*8
5175 X2=X1/2
5180 P=LOG(10*(DCJ1*61/10*4))
5185 Q=FN49
5190 NEXT J1
5195 Q=FNGL+9
5200 W1=-FC31*FC11.2
5205 V6=B*PCX-FC11*W1
5210 V=FC11
5215 E9=SQRT(E2 N9)
5220 RETURN 0

```

# D - REWORK (cont)

```

5230 R=443
5240 H9=0
5245 FOR J1=0 TO 6
5250 X2=DC J1,53,10,60,0
5255 X1=EXP(4+LOG0.5*(12-H1-1))
5260 P=10*(DC J1,63,10,4)
5265 Q=FNGH9
5270 NEXT J1
5275 Q=FNG(-9)
5280 V6=FC(23)+Q
5285 M3=V6+Z
5290 Y=M3/2
5295 X1=FHZH0
5300 M=(Y-1)/X1
5310 E9=SQR(R2/H9)/V6
5315 RETURN 0
5320 R=444
5321 MCN8,1]=INT(DC 4,21,10+0.5*(10+H0-100)
5322 Z=AC(83)+E-04
5323 Q=FNW7
5324 MCN8,4]=AL(103)+E-04
5325 MCN8,5]=E7=2*SQR(LOG0.5 FC(17)+B/60)
5326 MCN8,6]=F
5327 Q5=M1*B/60
5331 MCN8,10]=H6+H7/100
5332 Q=FNS2+FNH1+FN01+FNH(10)+FNH3+FNH1+FNH5
5333 PRINT TAB(30,"BEST FIT FOR 5 CUIS")
5334 PRINT
5335 FORMAT "REWORK FILE TAPE TIME(hrs) EFF AREA Ta(K) SKY BRIGHT "
5340 WRITE (15,5335)"ELE"(deg) RUN SET"
5345 FORMAT F5.1,F5.0,F5.0,F10.3,F9.1," m12",F7.1,F8.2," K",F10.1,F7.0,F5.0
5350 WRITE (15,5345)MC1,103,2*H8+7,V0,DC 4,43,1000,D9,H9,B4,MCN8,13,H6,H7
5355 Q=FNS2
5370 WRITE (15,2000)S#1(")Ta DECL OFFSET: "13#
5375 FORMAT F2.0,F6.0,F9.3,F9.3,"deg",F10.4,F9.4," +",F6.2," ",F11.3,"deg"
5380 WRITE (15,5375)1,H9,DET(C),E7,2,V6,100*E9,Q5
5385 Q=FNW8
5450 MCN8,2]=10*LGTM
5452 MCN8,3]=10*LG((M3-2)/X1)
5460 Q=K*S[MCN8,4]/(Y-1)/1000
5463 MCN8,7]=Y
5465 MCN8,8]=Q-(B4+3)/B9*1.38054
5470 MCN8,9]=Q/K1-3/B9*1.38054
5480 WRITE (15,5375)2,H9,DET(C),E7,2,V6,100*E9,Q5
5485 Q=FNS2
5490 FORMAT " +HPSW#1 Y-FACTOR T(K) DT("
5495 WRITE (15,5490)S#1(") G(GB) G(TGB) NEF NUF"
5500 Q=MCN8,3]+10*LGTH9
5505 FORMAT F6.3,"deg",F10.4,F9.3,F9.2," K",2F9.2,F8.3,F7.3,"kFU"
5510 WRITE (15,5505)MCN8,43,Y,2*H9,V6+H9,Q,MCN8,23,MCN8,83,"kFU",MCN8,93
5515 Q=FNS1+FNH5+FNH1
5520 PRINT TAB(23,"100% DUTY FIT) (DUT) 10("13#1(")TA)
5525 FORMAT /,10X,"DUT",5F10.0/,F24.2," ",5F9.2
5530 RESIM YC53
5535 FOR I=2 TO 6
5540 X2=DC I,53,16,65,0
5545 X1=EXP(4+LOG0.5*(X2-H1-12)
5550 YC I-1]=100*(101+DC,63,10,4)-(FC(23)+X1+FC(13)+X2+Q)/V6)
5555 NEXT I
5560 WRITE (15,5525)2,-1,0,1,2,YC(1),YC(3),"A",YC(3),"Z",YC(4),"N",YC(5),"N"
5565 Q=FNS2
5570 RESIM YC23
5572 RETURN 0

```

## D - REWORK (cont)

[illegible]

# D - REWORK (cont)

R	1	1828	1895	1925	1998	2045	1715	1759	1848	1928	2030
		2140	2208	2259	2440	2490	3018	3035	3118	3185	3225
		3255	3388	3570	3815	4198	4268	4365	4488	4688	4570
		4815	4847	4863	4895	4985	5088	5617	5938	5675	5188
		5328	5574	5680	5624	5633	5642	5648	5688	5690	5888
R	1	1825	1888	2020	2025	2285	2298	4958	4355	4955	4968
R1	1										
R2	1	838	5636								
R3	1										
R	1	465	478	488	488	488	756	1878	1888	1958	2058
		4928	5168	5178	5258	5325	5327	5548	5585	5658	
B8	1	478	488	485	765	765	778	778	888	888	5585
		5653									
B1	1	1818	1838	4053	4645	4658					
B2	1	1848	4918	4928	5653	5655					
B3	1	1848	4928	5644	5653						
B4	1	468	4682	5358	5465	5631					
B5	1	55	3384	5085	5098						
B6	1	68	3386	5188	5185						
B7	1										
B8	1										
B9	1	4682	4915	5358	5465	5478	5631	5657			
C	1	688	3418	4888	4938						
C8	1	488	485	488	488	445	5628				
C1	1	568	4988	4915	5657						
C2	1	4885	4865	4356	4682	4658	5648				
C3	1										
C4	1										
C5	1										
C6	1										
C7	1	5631	5655								
C8	1	4635	5648								
C9	1	838	5636								
B	2	698	4018	4928	5428	1653	5655				
D8	2	4985									
D1	2	798	5636								



# D - REWORK (cont)

D2	2	780	735	5631								
D3	2	4645										
D4	2											
D5	2											
D8	1	835	5640									
D9	2	840	5640									
E	2	3345	3350	3350	3390	4005	4005	4005	4010	4155	4035	
	4335	4650										
E0	2	740	4360	4650								
E1	2	745	1805	1830	4360	4650						
E2	2	790	4360	4650								
E3	2	795	4360	4650								
E4	2	800	4360	4650								
E5	2	810	1660	1880	1950	2050	2120	4360	4650			
E6	2	815	2110	2130	2135	2290	4360	4650				
E7	2	830	2130	2130	2255	2290	4360	4650	5325	5380	5480	
E8	2	835	1742	1950	3050	2120	4360	4650				
E9	2	840	4357	4650	5215	5310	5380	5480				
F	2	64	390	390	390	415	415	430	500	525	525	
	690	795	1725	1730	3626	3090	3136	3138	4335	4900	4905	
	4910	4920	4940	4950	4950	4955	5040	5041	5042	5326	5653	
	5655											
F0	2	4955										
F1	2	1444	1835	1900	1955	1960	1965	2150	2170	2260	2450	
	2470											
F2	2	975	1155	1655	3130	3615	3630	3915	3915	3915	3915	
	3990	3995	3995	3995	3995	4340	4550	4563	4575	4578	4578	
	4580	4580	4585	4585	4600	4600	4615	4615	4840	4843	4845	
	4845	4845	5140									
F3	2	61	1710	1720	5845							
F4	2	1655	1655	1675	2975	5825						
F5	3	62	3125	3112	3210	5030						
F6	3	1400	3135	3217	3228	3620	4215	5030				
F7	3	61	1675	1600	2975	2975	3035	3030	4995	5025	5035	
F8	3	1639	1745	5665	5670							
F9	3	62	900	3000	3070	5015	5015	5025	5845			
G	3	820	985	1075	1075	4615	4617	4910	4915	5631	5655	
	5657											

# D - REWORK (cont)

G4	3	400	440	5620								
G5	3	420	440	5620								
G6	3	430	440	5620								
H	3	1655										
H1	3	810	4575	4578	5631							
H5	3											
H9	3	61	990	1075	1075	1930	1940	2040	2520	3028	5050	
		5500	5510	5510	5631	5644	5646	5845				
I	3	280	290	295	710	720	1090	1095	1105	1115	1120	
		3035	3040	3040	3045	3045	3050	3300	3305	3305	3310	3325
		3330	3335	3340	3355	3355	3355	3355	3355	3360	3360	3440
		3445	3445	3450	3455	3460	3465	3480	3510	3710	3715	3720
		3720	3725	3750	3755	3755	3760	3810	3820	3820	3825	3830
		3835	3885	4925	4930	4935	4935	4940	4940	4940	4945	4945
		4945	4950	4950	4950	4950	4960	4960	4965	4970	4975	5045
		5050	5050	5055	5055	5060	5535	5540	5550	5550	5555	
I5	3	995	1005	1145	1165	3060	3665	3690	3690	3755	3770	
		3895	3930	4010	4045	4945	4960					
J	3	2560	2964	3340	3355	3430	3435	3455	3455	3455	3455	3480
		3490	3495	3500	3505	3520	3550	3580	3585	3590	3590	3595
		3635	3640	3640	3650	3665	3665	3885	3915	3915	3990	3995
		3995	4000	4000	4000	4025	4285	4285	4285	4435	4435	4435
		4435	4435	4435	4435	4440	4445	4450	4455	4455	4495	4500
		4500	4505	4510	4515	4520	4525	4525	4530	4535	4540	4575
		4576	4576	4578	4578	4600	4600	4602	4602	4835	4835	4835
		4845	4845	4845	4845							
J1	3	525	530	3885	3895	3980	5165	5170	5180	5190	5245	
		5250	5260	5270	5036							
K	3	550	555	1040	1075	5460						
K1	3	455	460	550	745	800	1040	5470				
K2	3	490	550	790	800	1040						
K3	3	495	550	1040								
K4	3	505	550									
K5	3	505	550									
K6	3	505	550	1040								
K7	3	505	550									
K8	3	530	550	800	835	1040						
K9	3	545	550	800	840	1040						
L0	4	3585	3610	4370								
L1	4	1655	3830	3840	3865	3890	3900	3900	3915	3915	3935	
L4	4	410	440	5620								
L5	4	425	440	5620								

# D - REWORK (cont)

L6	4	435	410	5630							
L7	4	385	415	415	420	430	445	900			
L8	4	445	535	5620							
L9	4	450	535	5620							
M	4	3410	4585	4010	4610	4017	4880	5300	5450		
M1	4	1270	1280	1300	1330	1340	1345	1366	1090	2445	2400
		2480	2495	2515	4525						
M2	4	1270	1285	1285	1335	1345	1350	1366	2550	2962	4500
M3	4	1270	1290	1290	1330	1335	1365	1366	4490	4500	4525
		5285	5290	5452							
N	4	1743	1760	1760	1770	1775	1880	3185			
N0	4	375	485	560	560	500	730	800	815	820	930
		1040	1040	1075	1700	1742	1845	1875	1885	3135	3382
		4640	5295	5321	5332	5460	5575				4315
N1	4	3710	4925								
N2	4	1000	1100	1140	1775	1780	1835	1880	1900	1935	1945
		2235	2300	2540	5140						
N3	4	955	965	1195	1200	1755	2055	2060	2065	2070	2090
		2160	2165	2175	2180	2195	2460	2465	2475	2490	2492
		2495	2515	2515	2520	2520	3810	3845	3845	3850	3860
		4955	4960								
N4	4	1230	1655	1785	1795	1950	2070	2110	2120	2160	2180
		2460									
N5	4	570	570	650							
N6	4	650	1741	1880	5331	5350					
N7	4	1740	1743	1770	1775	1880	5331	5350			
N8	4	1670	2995	5321	5324	5325	5326	5331	5350	5350	5450
		5452	5463	5465	5470	5500	5510	5510	5510	5510	
N9	4	1270	1275	1275	1330	1335	1340	1345	1350	1365	1366
		1755	2015	2025	2045	2005	2130	2130	2145	2190	2280
		3440	3485	3525	3530	4490	4500	4505	4525	4530	5155
		5215	5240	5265	5310	5300	5480				5185
P	5	1160	1160	1165	1170	1170	1205	1290	1310	1315	1320
		1925	2065	2080	2080	2095	2165	2205	2465	2480	2485
		3480	3490	3495	3500	3505	5180	5260			2485
P1	5	785	790	5631							
Q	5	65	275	200	305	310	330	335	345	345	390
		400	405	410	410	415	420	560	535	540	575
		575	590	625	630	675	705	710	865	870	895
		900	910	915	1055	1130	1165	1210	1210	1215	1215
		1245	1250	1260	1265	1370	1374	1378	1380	1380	1387
		1415	1420	1440	1470	1640	1675	1680	1685	1695	1710
		1735	1746	1845	2015	2025	2050	2055	2055	2085	2125
		2130	2155	2175	2190	2200	2280	2290	2295	2365	2310
		2455	2475	2515	2520	3500	2535	2900	2995	3000	3000

# D - REWORK (cont)

		3000	3000	3005	3010	3021	3032	3033	3055	3065	3070	3095
		3120	3139	3140	3144	3145	3175	3185	3205	3216	3221	3240
		3310	3315	3315	3345	3355	3373	3382	3410	3415	3425	3515
		3540	3545	3555	3555	3600	3695	3700	3775	3852	3895	3935
		3955	4010	4015	4020	4070	4075	4080	4080	4090	4095	4100
		4100	4170	4180	4205	4275	4340	4355	4357	4358	4360	4360
		4360	4360	4360	4360	4360	4360	4360	4360	4360	4360	4365
		4415	4445	4450	4455	4470	4470	4455	4555	4580	4585	4600
		4615	4620	4650	4651	4651	4665	4670	4675	4680	4900	4935
		4940	4960	4960	4965	5010	5022	5030	5035	5043	5125	5145
		5265	5275	5323	5332	5355	5385	5460	5465	5470	5485	5500
		5510	5515	5565	5590	5601	5835	5850	5856			
00	5	765	770	775	1383	1384	3325	3355	3565	3580	3585	
		4357	4360									
01	5	590	595	610	625	625	625	770	775	1955	1965	
		3060	3065	3070	3090	3090	3330	3355	4358	4360	4435	4440
		4440	4445	4445	4800	4885	4885	5025	5030	5035		
02	5	395	400	405	410	420	420	425	430	445	460	
		485	490	490	530	545	755	775	785	3335	3355	4940
		4965	4965	4970								
03	5	1705	1710	1725	1730	4935	4940	4950				
04	5											
05	5	5327	5380	5400								
06	5											
07	5											
R1	5	990	995	1005	1075	1075	1145	1145	1165	3645	3660	
		3665	3665	3755	3995	3990	4045	4440	4450	4455	4460	4460
R2	5	1365	2015	2100	2260	4490	4505	4530	5215	5310		
R5	5											
S	5	540	545	4360	4505	4510	4515	4640	4650			
S3	5	1990	2020	2025	2025	2035	2080	4530	4535	4540		
T	5	820	985	990	1930	1940	2040	4617	5631			
T1	5	3995	4005	4045	4175	4335	4660	4662				
T2	5	3835	3960									
T6	5	1655	1700	1785	1790	1800	1805	1810	1825	1830	2005	
		2135	2165	2220	2230	2405						
T9	5											
U	5	1925	2065	2105	2405							
U1	5											
V	5	1950	2100	2130	2135	5216						
V1	5	1270	1295	1295	1340	1890	2445	2430	2485	2515		
V2	5	1270	1300	1300	1350	2500	2964					
V3	5	1270	1305	1305	1345							

D - REWORK (cont)

V4	6	1270	1310	1310	1330						
V5	6	1270	1315	1315	1335						
V6	6	1270	1320	1320	1365	4490	5205	5200	5235	5310	5380
	5480	5510	5550								
V7	6	1800	2025	2055	2055	2070	2110	2180			
V8	6	61	930	3030	5005	5065	5050				
V9	6	1875	1910	2020	2345						
W	6	500	735								
W1	6	1960	1995	2025	2080	2105	2110	2125	2185	3915	3930
	5200	5205	5255	5327	5545						
X	6	1160	1360	1990	2175	2240	2335	2290	2290	3900	3905
	3905	3930	3947	3950	3950	4045	4070	4075	4080	4080	4085
	4085	4090	4095	4100	4100	5205	5230	5550			
X1	6	980	985	1075	1160	1285	1360	1365	1315	2070	2075
	2075	2080	2105	3465	3470	3475	5170	5175	5255	5295	5300
	5452	5545	5550	5575							
X2	6	1160	1200	1295	1305	1310	2075	2180	2185	3475	5175
	5250	5255	5540	5545	5550						
X5	6										
X6	6										
Y	6	820	825	825	985	995	1005	1075	1075	5290	5300
	5460	5463	5510	5631							
Y1	6	4360	4635	4650							
Y5	6	825	830	2550	2962	4635					
Z	6	1940	2240	2245	2495	2515	2520	2520	2530	5285	5290
	5322	5380	5452	5480	5510						
Z1	6	8	440	455	5620						
Z5	7	1650	1765	3210	3215	3219	5010				
FNA	7										
FNB	7	275	1415	1465	3331	3600	3630	4240	4350	4865	5085
FNC	7	565	1845	3240	3415	3695	4265	5332			
FND	7										
FNE	7	730	4620								
FNF	7	1055	1130	1230	1370	1440	1746	1746	1746	2960	2960
	2960	3730	3775	3852	4170	4265	4300	4380	4380	4380	4555
	5018	5018	5530								
FNG	7	1250	2065	2070	2180	2205	3485	4485	5185	5195	5265
	5375										
FH1	7	335	1845	3310	2035	5005	3605	4265	4380	4380	5332
	5515										

# D - REWORK (cont)

FNJ	7	65	1387	1735	3120	3139	3140	3140	3144	3240	5043
	5856										
FNK	7	375	560	1845	3695	4265	5332	5651			
FNL	7	3140	3140	3140	3140	3140	3140	3140	3140	3140	3140
	3140	3565	4851								
FNM	7	865	1845	3695	4265	5332					
FNN	7	305	1380	1415	1444	1465	3021	3130	3630	4240	4850
	5005	5015	5085	5100							
FNP	7										
FNQ	7	200	1870	5160	5050						
FNR	8										
FNS	8	575	735	870	1675	1746	2960	3013	3023	3895	3205
	3240	3375	3415	3415	3545	3555	3695	3730	4100	4265	4265
	4265	4275	4340	4380	4405	4415	4850	5332	5332	5355	5485
	5515	5515	5565	5590							
FNT	8										
FNU	8										
FNW	8										
FNX	9										
FNY	8	955	2155	2175	2455	2475					
FNZ	8	560	820	980	1040	1875	5295	5575			
FLJ	9	385	385	395	890	890	890	895	895	900	900
	900	900	1685	1690	1705	1740	1740	1741	1925	2245	2255
	3384	3386	5085	5090	5100	5105	5322	5324			
FLJ	9										
FLJ	9	1355	1360	1405	2025	2130	2290	5380	5480		
FLJ	9	1700	1735	1795	1800	1805	1810	1825	1830	2065	2135
	2165	2220	2230	2465	5135	5170	5180	5250	5260	5321	5350
	5540	5550									
FLJ	9	1160	1160	1360	1365	1365	1366	1366	1405	1995	2015
	2025	2100	2105	2105	2125	2210	2210	2230	2280	2290	2290
	5200	5200	5205	5210	5280	5325	5550	5550			
GLJ	9	1340	1345	1345	1350	1355	1405	4495	4515	4520	4540
HLJ	9	52	1405	1642	1670	1747	1747	2980	2980	3000	3000
	3000	3000	3000	3065	3310	3325	3330	3335	3340	3355	3355
	3355	3355	3355	3405	3405	3420	3425	3450	3455	3460	3465
	3480	3825	3830	3835	3885	4885	4885	5030	5321	5324	5325
	5326	5331	5350	5450	5452	5463	5465	5470	5500	5510	5510
	5510	5510	5815								

# D - REWORK (cont)

NC J	9	63	200	200	220	220	920	940	1465	1465	1640
	1910	1910	1930	1930	2030	2030	2035	2035	2340	2040	2385
	2285	2530	2530	025	3038	3040	3045	3070	3070	3130	3130
	3455	3455	3450	1495	3500	3505	3530	3595	3635	3640	3640
	3650	3665	3665	3915	3915	3990	3995	3995	4440	4445	4455
	4455	4495	4500	4500	4505	4510	4515	4520	4525	4525	4530
	4535	4540	4575	4575	4578	4578	4578	4585	4585	4600	4600
	4615	4615	4845	4845	4845	4845	5035	5040	5050	5055	5350
	5585	5585	5637	5640	5644	5644	5644	5644	5670	5670	5835
	5845	5845	5845	5845	5845	5850	5852				
SC J	9	560	800	1040	1075	1742	4940	4945	4945	4970	5460
TC J	9	485	815	1885	3030	3640	3645	3350	3715	4285	4640
	4835	4840	4930	4935	4935	4940	4940	4945	4950	4950	4950
	4950	4960	4960	4965	5050	5055	5065	5636	5640		
XC J	9										
L#	50	930									
L	200	200	455	525	535	535	1830	1870	1880	1930	2020
	2035	2040	2285	2530	3692	3365	3870	3870	3875	3875	3890
	3995	3995	4050	4160	4160	4280	4335	4410	4580	4580	5135
	5160	5650									
B#	315	320	325	3905	3955	4285	4290	4335	4825	4840	4845
R#	340	345	345	350	350	355	355	365	365	365	365
	365	1135	1180	1185	1195	1205	1215	1220	1235	3790	3855
	3940	3945	3950	3955	3980	4065	4075	4080	4085	4095	4100
	4152	4152	4155	4172	4220	4230	4235	4820	4835	4845	5695
	5705										
H#	580	1690									
X#	580										
P#	670	670	675	675	675	675	1685	3030	5065		
FNH	910	1845	3240	3415	3695	3730	4265	4265	5332		
D#	945	3226	3575	3705	3720	3905	4175				
E#	945										
S#	1065	1690	1885	1910	2005	2270	3350	3355	3715	3720	5370
	5370	5495	5520								
YC J	1330	1335	1360	1365	1365	1405	4195	4200	4205	4210	4245
	4255	4255	4255	4280	4280	4280	4420	4495	4505	4520	4530
	5530	5550	5560	5560	5560	5560	5560	5570	5820		
FN0	1378										
FNV	1383	1470	1640	1640	1965	2309	3023	3148	3148	3148	3216
	3221	3515	3540	3615	4005	4315	4615	4620	5018	5323	5385
	5855										
R0	1643	5052									



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- [8] The Fahrenheit temperature scale is used instead of the Celcius scale because it is easier to implement a temperature scale which is non-negative over the measurement range.

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